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# **China Report**

**SCIENCE AND TECHNOLOGY**

**No. 81**



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5 February 1981

# CHINA REPORT SCIENCE AND TECHNOLOGY

No. 81

## CONTENTS

### NATIONAL DEVELOPMENTS

- Science, Technology Filing Regulations Implemented  
(Xinhua Domestic Service, 24 Jan 81)..... 1

- Briefs  
Y-10 Reportedly Flies 2

### PHYSICAL SCIENCES

- Briefs  
Lithium Iodate Crystals 3

### APPLIED SCIENCES

- Chasre/30 Software for Recognition of Chinese Characters Developed  
(Zhu Dequan; DIANZI XUEBAO, Sep 80)..... 4

- Digital Vocoder With 2400 Bits Per Second Developed  
(Li Changli, Mo Fuyuan; DIANZI XUEBAO, Sep 80)..... 9

- Design, Building of PASCAL-655 Self-Compiling System Outlined  
(Wang Yicheng, et al.; DIANZI XUEBAO, Sep 80)..... 26

### LIFE SCIENCES

- Progress in Cancer Prevention, Cure Called Considerable  
(GUANGMING RIBAO, 23 Nov 80)..... 43

- Fine Results Achieved in Abnormal Hemoglobin Research  
(GUANGMING RIBAO, 26 Nov 80)..... 45

### SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

- Briefs  
Beijing Science Conference 47

## PUBLICATIONS

Table of Contents of 'LIUXINGBINGXUE ZAZHI' No 3, 1980.....	48
Table of Contents of 'YUANZHE WULI' No 3, 1980.....	51
Table of Contents of 'WUTAN YU HUATAN' Nos 2 and 3, 1980.....	53
Table of Contents of 'SHENJING-JINGSHEN JIBING ZAZHI' No 3, 1980.....	55
Table of Contents of 'SHENJING-JINGSHEN JIBING ZAZHI' No 4, 1980.....	57
Table of Contents of 'BANDAO TI XUEBAO' No 4, 1980.....	59
Table of Contents of 'GAOENG WULI YU HE WULI' No 6, 1980.....	61
Table of Contents of 'JIANZHU XUEBAO' No 5, 1980.....	64
Table of Contents of 'WUTAN YU HUATAN' No 5, 1980.....	66
Table of Contents of 'DIANLI JISHU' No 10, 1980.....	67

## ABSTRACTS

### AERONAUTICS

HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE], No 12, Dec 80.....	69
--	----

### ENGINEERING

GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS], No 4, Nov 80.....	71
--	----

### GEOGRAPHY

DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE], No 8, 11, 12, 80.....	79
---	----

### MECHANICAL ENGINEERING

JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING], No 4, 15 Dec 80.....	83
---	----

### SEISMOLOGY

DIZHEN ZHANXIAN [SEISMOLOGY FRONT], No 6, 26 Dec 80.....	88
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## NATIONAL DEVELOPMENTS

### SCIENCE, TECHNOLOGY FILING REGULATIONS IMPLEMENTED

OW241450 Beijing Xinhua Domestic Service in Chinese 1139 GMT 24 Jan 81

[Text] Beijing, 24 Jan (XINHUA)--The "Regulations Governing Scientific and Technological Filing Work," approved by the State Council, were recently issued by the State Economic Commission, the State Capital Construction Commission, the State Scientific and Technological Commission and the State Archives Bureau to various State Council departments and concerned departments of various provinces, municipalities and autonomous regions for implementation.

The regulations are formulated to meet the requirements of the socialist modernization program. The regulations contain stipulations with regard to the formation and filing of scientific and technological documents and materials, scientific and technological file management, the administrative system for scientific and technological filing work, the building up of the ranks of scientific and technological file cadres and so forth.

The regulations say: Scientific and technological files refer to drawings, charts, written materials, calculating materials, photos, films, videotape recordings, sound recordings and other scientific and technological documents and materials formed in natural science studies, productive technological activities, capital construction activities and so forth that should be placed on file for safekeeping.

The regulations call on economic and construction departments and scientific research, educational, public health units and so forth to include scientific and technological filing work in the administration of production, technology and scientific research, to strengthen leadership, and to establish and perfect scientific and technological filing in accordance with the basic principle of centralized and unified management so that scientific and technological files will be complete, accurate, systematized, safe and effectively utilized.

The regulations stipulate: The various specialized responsible organizations under the State Council and those under the people's governments of provinces, autonomous regions and municipalities directly under the central government should all build a contingent of scientific and technological filing cadres who adhere to the socialist road, are equipped with professional knowledge in scientific and technological filing, understand the related science and technology and have specific working abilities. All the units should assign a sufficient number of competent cadres as well as a certain number of scientific and technological cadres to the scientific and technological filing departments to insure meeting work requirements.

CSO: 4008

## NATIONAL DEVELOPMENTS

### BRIEFS

Y-10 REPORTEDLY FLIES--According to information from Beijing, China has reportedly conducted the first series of test flights of its long-range Y-10, a copy of the Boeing 707 equipped with four JT3D engines. The first flight of the plane reportedly took place in Shanghai during last September. This information, which is completely unconfirmed, runs contrary to American source information according to which the problems encountered during the development of this plane were reportedly extensive enough to prevent it from flying. [Paris LE MONITEUR DE L'AERONAUTIQUE in French Jan 81 p 7]

CSO: 4008

## PHYSICAL SCIENCES

### BRIEFS

LITHIUM IODATE CRYSTALS--Beijing, 17 Jan (XINHUA)--The dimensions and quality of single crystals of alpha-lithium iodate made by China and the progress of Chinese scientists' basic study of such crystals have reached advanced international levels. The maximum diameter of such crystals produced by China's scientists is over 70 millimeters and they weigh more than 1 kilogram each. More than 40 Chinese scientific and technological research units now have such crystals in use. Single crystals of alpha-lithium iodate are an important material used in laser and supersonic technology. [Beijing XINHUA Domestic Service in Chinese 0307 GMT 17 Jan 81 OW]

CSO: 4008

CHASRE/30 SOFTWARE FOR RECOGNITION OF CHINESE CHARACTERS DEVELOPED

Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, Sep 80 pp 99-101

[Article by Zhu Dequan [2612 1795 0356]: "The CHASRE/30 Software for Recognition of Chinese Characters." This article was received in January 1980]

[Text] (Abstract) the CHASRE/30 software has been developed for automatic recognition of printed, typed and handwritten Chinese characters. This recognition logic can also be used for automatic recognition of letters and numerals. This article briefly introduces the principles of recognition by this system, and presents the results of computer simulation using this software logic.

I. Foreword

Directly processing original information by a machine is frequently a big hurdle that has to be overcome by some high level automatic systems. One of the more frequently seen problems is the recognition of the written word. Solution of this problem will directly affect the popular application of the computer in all fields and professions, such as automation of news communication and postal and telegraphic services, processing scientific and technological information, search and management of library materials, filing of various types of documents and information, automatic processing of bank data, automatic techniques of composition and printing, and automatic translation of written languages.

Studies in automatic recognition of written languages have developed very rapidly in recent years, and major achievements have been realized. At present, the machine can already recognize<sup>1-4</sup> printed English, certain words, symbols and numbers in cursive in printed form, and some handwritten words and symbols. In studies of automatic recognition of Chinese characters, some progress has also been achieved,<sup>5-8</sup> such as the automatic recognition system developed by Japan that can read nearly 2,000 printed Chinese characters. A system that recognizes handwritten Chinese characters with instruments connected to the machine via special methods has also come into existence. The means of recognition can generally be divided into two kinds: One kind is the theoretical method based on decisions, or called statistical method or mathematical method.<sup>9</sup> The other kind is the method of syntactical structure, or called structural method, linguistic method,<sup>10,11</sup> Because there are numerous Chinese characters and the form of the characters is complex, they create many difficulties for machine recognition. At present, problems still exist in reading printed Chinese characters

with over 2,000 characters and symbols. Especially in the recognition of handwritten Chinese characters that vary greatly, the machine can do nothing.

The CHASRE/30 software has been developed for automatic recognition of Chinese characters of multiple type faces. This recognition logic can also realize automatic recognition of letters and numerals. The system does not limit the number of Chinese characters and symbols. Its recognition ability is not affected by changes in the amount of characters. Requirements imposed upon the type faces at present are the limitations of the ability to recognize only printed, typewritten or handwritten print forms (called "elementary type faces"). Automatic recognition of the common handwritten cursive forms has shown a promising future.

## II. General Description

The CHASRE/30 software defines all formal characters that can be provided for recognition as real characters and represents characters containing similar structures (called commonly structured characters) by a nonformal character (virtual character). This virtual character is called the root character.

This system defines the collection of Chinese characters as the Chinese character set. Its scope is called the Chinese character range.

Within the scope of elementary type faces, the entire body of real Chinese characters can be further divided into standard characters and nonstandard characters. Nonstandard characters generally possess at least one of the following situations: The strokes of the character are not written according to rule, abnormally connected strokes occur within the character, the number of strokes is incomplete, the strokes are ambiguous. Because nonstandard characters frequently occur in large numbers in real life, therefore, the ability of the machine to process nonstandard characters will directly affect the practical value of the system. The CHASRE/30 software provides a way for the recognition of not only standard characters but also the nonstandard characters.

The total function of the CHASRE/30 is based on simulating human thought.

Real characters are input into the computer by "0" and "1" messages. Matrix A retains these messages. A is called the character matrix as shown in Figure 1. Thus, the object processed by the machine is summed up as an enumerable set of elements of the character matrix.

If we define  $B'$  as the set of all root characters,  $B$  is the set of all real characters defined by the elementary type faces, then the recognition  $\sigma$  of the characters can be viewed as a projection from  $B$  to  $B'$ :

$$B \xrightarrow{\sigma} B'.$$

Because, for any  $b' \in B'$ , there exists at least one  $b \in B$ , so that

$$\sigma(b) = b'$$

and, for commonly structured characters  $b_1, b_2$  ( $b_1 \in B, b_2 \in B, b_1 \neq b_2$ ), there will always be

$$\sigma(b_1) = \sigma(b_2).$$

Therefore,  $\sigma$  is a full projection from  $B$  to  $B'$ , but not one to one.

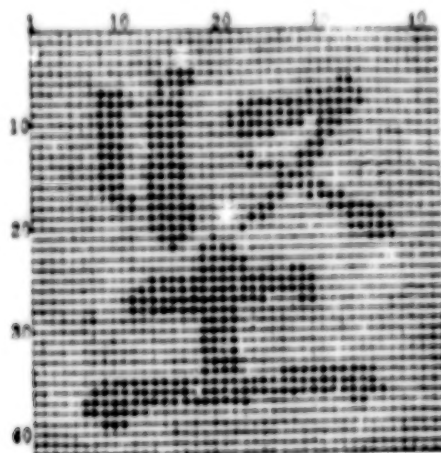
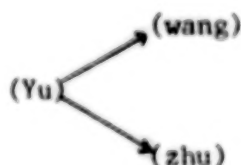
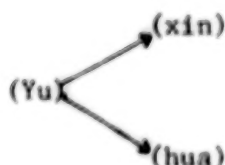


Figure 1. Character Matrix A

The special abilities of the human brain are its memory and its ability to rapidly, ingeniously and effectively select and combine information obtained. The function of association of concepts and sensitivity are the bases that constitute these abilities. If the ideographic forms of such characters as "wang," "zhu" already exist in the memory, then, when recognizing a character "yu" that has not yet entered into the memory, a natural association is:



and the following association



generally will not occur. This graphically describes the logic of thought particular to humans in recognition of the written word. Extraction and classification of characteristics are the bases and means for realizing this function. To construct a recognition system that can fluently read characters having numerous changes, the important point is to provide the machine with



the above function. With this as the goal, the CHASRE/30 took in the concept of the "character tree." All elements in the Chinese character set form a mutually connected organic whole.

### III. Results of Experiments

To test the logic of the CHASRE/30, we first took the standard characters as objects, and we conducted a simulation experiment of the recognition ability of that system. The method was to select at random the following 66 Chinese characters from the Chinese character set, i.e.,

半 半 半 半  
章 章 呆 呆  
抖 坚 语 英  
友 京 布 劝

Figure 2. Part of the Input Characters for the Experiment

and we used regular script, bold and Song type faces and many other scripts. Seventy-three real characters were written as input information for the computer to read. Except for one character, all others were successfully read. The results show the CHASRE/30 system not only has a very strong ability to differentiate different characters within the Chinese character set but also has a good ability to incorporate the real character that is different from the root character. It does not impose strict demands on the position of writing the character, the thickness and fineness of the strokes and their lengths, thus, it does not overly limit the writer. Figure 2 lists some of the real characters used in the experiment.

The experiment was conducted on a computer with a slower speed. The average speed of recognition of these 72 Chinese characters by the machine was 7 seconds per character. This speed is related to the degree of standardization of the written character and the complexity of the character. If some measures can be implemented for the hardware, and the software optimized, then, without increasing the computational speed of the machine presently being used, the speed of recognition can be improved by one order of magnitude.

The task faced by this system in the near future is to improve the speed of recognition and to expand the range of Chinese characters to over 5,000 characters.

# REFERENCES

1. K. Nakata, "Pattern Recognition and Its Application," Korona Sha, 1978.
2. R. J. Spinrad, "Information and Control," Vol 8, No 2, 1965, pp 124-142.
3. R. Oba, Papers of the Electronic Communications Society. Vol 55-D, No 1, 1972, pp 77-81.
4. Compiled by the Special Committee on Automatic Recognition of Words and Graphs, Electronics Society, Automatic Recognition of Words and Graphs, Electronics Society, Tokyo, 1970.
5. K. Nakata, Y. Nakano, S. Yamamoto, M. Yasuda, H. Terai, First USA-Japan Computer Conference, 1972, pp 296-301; (Chinese translation, translated by Liu Jinduo [0491 6855 6995], "Collected Translations on Computing Technology," Science Press, 1976, pp 143-148).
6. K. Fujita, D. Nakanishi, S. Miyada, Information Processing, Vol 17, No 12, 1976, pp 1098-1104.
7. H. Terai, K. Nakata, Papers of the Electronic Communications Society, Vol 56-D, No 5, 1973, pp 312-319.
8. H. Itai, S. Hirai, B. Kawata, S. Muno, K. Mori, Information Processing, Vol 17, No 7, 1976, pp 587/594.
9. K. Fukunaga, "Introduction to Statistical Pattern Recognition," Academic Press, New York, 1972.
10. T. Pavlidis, "Structural Pattern Recognition," Springer Verlag, New York, 1977.
11. S. Monta, D. Yasuda, S. Yamamoto, K. Oka, Information Processing, Vol 17, No 7, 1976, pp 603-610.

9296

CSO: 8111/0199



DIGITAL VOCODER WITH 2400 BITS PER SECOND DEVELOPED

Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, Sep 80 pp 73-84

[Article by Li Changli [2621 2450 4539] and Mo Puyuan [5459 4395 3293]: "2400 Bits Per Second Digital Vocoder"]

[Text] (Abstract) A 2400 bits per second digital vocoder that can operate on real-time has been successfully developed. The vocoder has a better linguistic quality and is suitable for language communication of a low data coding rate.

Based on our studies in linguistic acoustics and the theory of Chinese linguistic information and with the help of a general purpose computer, we conducted a nonreal time simulation of the 2400 b/s digital channel vocoder, and used TTL high speed medium and small scale integrated circuits to build the hardware for that vocoder. Experiments show the understandability and naturalness of the synthesized language are good and the dimensions of the hardware are small, suitable for applications in communications engineering.

1. Introduction

Representing linguistic signals that occupy a band width of 3000 Hz by signals of a band width smaller than 100 Hz<sup>1</sup> is still a very intriguing topic. The way to realize this is by analysis and synthesis of linguistic signals--the vocoder.<sup>2</sup> As sampling data theory, the computer and large scale integrated circuitry develop, techniques of analysis and synthesis have also advanced relatively greatly.<sup>3</sup> We combined our studies of the characteristics of the Chinese language and simulated a linguistic analysis and synthesis system on the computer. We extracted the characteristic parameters from the linguistic signals and coded and compressed them, and then decoded them and synthesized them anew. Then, we used the computer as a designing tool to simplify the theory and obtained a design for the hardware of the vocoder that is easy to build from an engineering standpoint. We also used TTL integrated circuits to assemble the machine. After evaluation of the indoor tonal quality and tests on the carrier wave transmission wire of 4000 km, the synthesized language was proven to be natural, understandable and the speaker can be recognized.

This article mainly discusses the characteristics of the plan, especially the extraction of the basic frequencies, design of the digital wave filter and the excitation source, design techniques of hardware logic and experimental results of the synthesized language.

## II. Introduction to the Overall Plan

The linguistic analysis and synthesis system introduced in this article--the block diagram of the vocoder, is shown in Figure 1. The original linguistic signals pass through a volume standardization process and are sent to an analog-digital converter and converted to digital quantities of a sample speed of 8 kHz and word length of 10 digits, then frequency spectrum analysis and tone extraction are conducted.

Frequency spectrum analysis consists of the band pass wave filter and the accumulation smoother. It shows the short-time frequency spectrum envelopes of the input language by the voltage of each channel. The best form of this type of frequency spectrum analyzer has been studied for many years and a lot of experience has been accumulated.<sup>4,12,13</sup> This plan started out from the statistical characteristics of the Chinese language.<sup>5,6</sup> When the signal/noise ratio is fixed in value, the passing capability of the message of the Chinese language within a unit band width is first computed. Then the total width of the frequency band and the number of channels are determined. Then, the passing ability of the messages in all frequency bands are equalized, and thus a group of band pass wave filters can be obtained. This method of dividing the frequency band is advantageous to differentiation of the characteristics of the Chinese language. Computations show this method is very close to division based on indices of equal clarity.<sup>7</sup> In addition, the characteristics of the wave filter should simultaneously take into consideration the rate of resolution of frequency and time. It must compromise between a better selectivity of frequencies and faster transient characteristics.<sup>8</sup> This plan selected a quadripole bi-zero Butterworth type digital filter.

The sampling speed of frequency spectrum envelopes is determined by the frequency spectrum of the signal of the channel.<sup>9</sup> Massive amounts of statistical materials on how to select the sampling speed of the Chinese language are still lacking. Preliminary experiments show a selection speed of 40 to 50 times per minute is better. To facilitate building the hardware, this plan used an accumulation smoother as a substitute for the rectifier and low pass wave filter, i.e., the absolute values of the output signals of the wave filters of each channel were taken and 160 sample points were accumulated as the sample values of the envelopes of each frame.

Chinese is a tonal language. To improve the quality of the synthesized language, the problem of extraction of the basic frequency must be solved very well. Practice shows that using the new method proposed recently by the author<sup>10</sup> can provide the synthesized language with a better degree of naturalness and understandability.

The analyzer at the transmitting end extracts the parameters of the linguistic characteristics. After they are coded and decoded, they are fed back to the language synthesizer at the receiving end.

The synthesizer is composed of the excitation source, linear inserter, multiplex multiple use digital wave filter group, the multiplier and the accumulator.

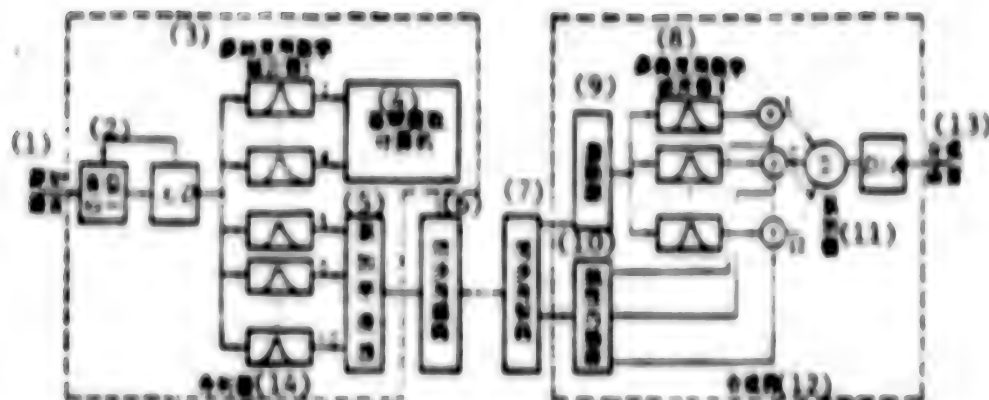


Figure 1. Principle of Language Analysis-Synthesis System (Vocoder)

Key:

- |  |   |
|--|---|
| (1) Original language                            | (8) Multiplex multiple use digital wave filter II |
| (2) Sound volume standardization                 | (9) Excitation source                             |
| (3) Multiplex multiple use digital wave filter I | (10) Linear inserter                              |
| (4) Base frequency extracting computer           | (11) Accumulator                                  |
| (5) Cumulative adder                             | (12) Synthesizer                                  |
| (6) Synchronization and coding                   | (13) Synthesized language                         |
| (7) Synchronization and decoding                 | (14) Analyzer                                     |

The excitation source starts the generator of random numbers of the triangular wave generator based on its determination of a voiced or an unvoiced sound, causing the output signals to pass through the digital wave filter and sending them to an input terminal of the multiplier. The sample value of the frequency spectrum envelope is sent to another input terminal of the multiplier via the linear insert channel. The accumulator forms the output product into a linguistic sample point. After being converted by the digital-analog converter, it is reverted back to become a linguistic signal.

### III. A Type of Simplified Multiplex Multiple Use Digital Wave Filter

The principles and design of the recursive digital wave filter have been discussed in many written works.<sup>14-20</sup> Attention must be paid when designing the digital wave filter hardware. Because the word length is limited, the coefficients are cut off and this will cause a positional change of the zero point and the pole.<sup>17</sup> The higher the order of the wave filter, the higher the required precision of coefficients. When the band width of the wave filter is narrow, the gain is large, and overflow easily occurs in computation. To overcome the above problem, the high order digital wave filter must be changed to a lower order cascade connection or parallel connection.<sup>18</sup> Since we selected the quadripole bi-zero Butterworth band pass wave filter and both zero points are on the unit circle, using the cascade connection can reduce multiplication, thus obtaining a simpler form.

If the coefficients of the two second order digital wave filters are respectively  $b_1, b_2, b_3, b_4$ , then in order that the transmission function of the center frequency of the band pass of the wave filter equals 1, the corrective coefficients of these two wave filters will be  $b_{01}, b_{02}$  respectively, the input signal is  $x(nT)$ , and output signal is  $y(nT)$ , ( $n = 0, 1, 2, \dots, \infty$ ), then the transmission function  $H(z)$  is:

$$H(z) = \frac{Y(z)}{X(z)} = b_{01} \cdot \frac{1 - z^{-1}}{1 + b_1 z + b_2 z^{-2}} \cdot b_{02} \frac{1 + z^{-1}}{1 + b_3 z + b_4 z^{-2}} \quad (1)$$

$$\left. \begin{aligned} f_1(nT) &= x(nT) - b_1 f_1[(n-1)T] - b_2 f_2[(n-2)T] \\ f_2(nT) &= b_{01}(f_1(nT) - f_1[(n-1)T]) \\ f_3(nT) &= f_2(nT) - b_3 f_3[(n-1)T] - b_4 f_4[(n-2)T] \\ y(nT) &= b_{02}(f_3(nT) - f_3[(n-1)T]) \end{aligned} \right\} \quad (2)$$

where  $f_1(\cdot), f_2(\cdot), f_3(\cdot)$  are intermediate variables.

The flow chart that realizes (2) is shown in Figure 2. It can be seen that multiplication takes up the most part of the above computations. To simplify the digital wave filter, the multiplier must first be simplified. Multiplication in the digital wave filter has the following characteristics:

(1) The word length output by the multiplier cannot surpass the uniform word length of each component of the digital network. Therefore it must be rounded off or cut off. (2) The multiplicand (data) is unknown and the multiplier (coefficient of the wave filter) is known, and the coefficient  $b_i$  of the second order digital wave filter under most situations satisfy  $-2 \times b_i \leq 2$ . Slight deviations are allowed in both the center frequency  $f_0$  of the wave filter in the vocoder and the band width  $\Delta B$ ,  $i = 1, 2, 3, 4, \dots$ . But  $b_i$  is not sensitive to these deviations, therefore  $b_i$  can be expressed as:

$$|b_i| = 2^{-c} \pm 2^{-d} \pm 2^{-e} \quad (3)$$

where  $c, d, e$  are any positive integer between -1 and 10. Computations show that proper selection of the numerical values of  $c, d, e$  enables  $b_i$  to approach the theoretical value desired (see Table 1), thus, multiplication is converted to addition and subtraction requiring two shifts.

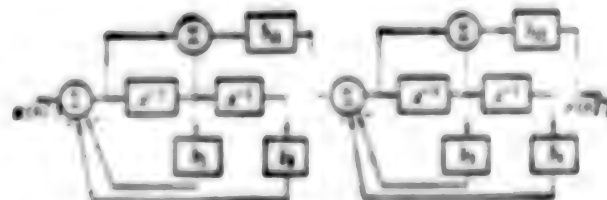


Figure 2. Four-Pole Butterworth Type Band Pass Filter Flow Chart

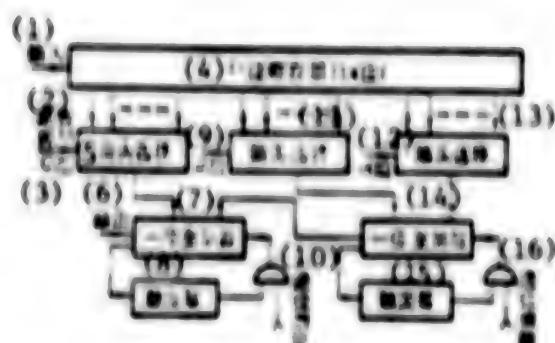


Figure 3. Principle of a Simplified Multiplier

Key:

- |                                |                           |
|--------------------------------|---------------------------|
| (1) Input                      | (9) B group               |
| (2) Coefficient control        | (10) Extraction selector  |
| (3) C group                    | (11) Carry clear          |
| (4) Shift register (14 digits) | (12) A group              |
| (5) Extraction selector        | (13) Extraction selector  |
| (6) Output                     | (14) One-digit full adder |
| (7) One-digit full adder       | (15) Trigger              |
| (8) Trigger                    | (16) Carry clear          |

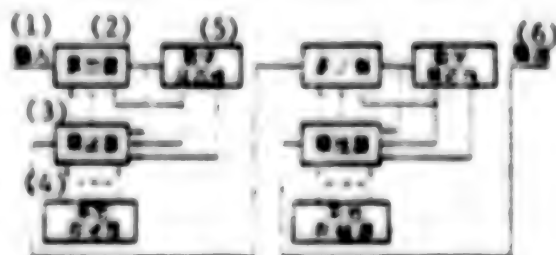


Figure 4. Principle of the Hardware of the Multiplex Multiple Use Digital Wave Filter

Key:

- |                 |                        |
|-----------------|------------------------|
| (1) Input       | (4) Coefficient memory |
| (2) Accumulator | (5) Digital delay line |
| (3) Multiplier  | (6) Output             |



Table 1. Design Parameters of the Digital Wave Filter

[illegible]

$b_{01} \times b_{02}$  equals the theoretical coefficient  $b_0$  in the table,  $b_0$  is the coefficient when the transmission coefficient of the filter is 1 (corrective coefficient of the central frequency)

**Key: (1) Wave filter**

(2) Central frequency

### (3) Specifications

(4) Band width

(c) Theoretical coefficient

(6) Simplified coefficient:

(7)

The simplified multiplier designed according to the above method is shown in Figure 3. The multiplex multiple use digital wave filter hardware actually built is shown in Figure 4. Its advantages are as follows: It uses "complement of 2" to carry out serial arithmetic computations, improving the degree of standardization of the circuits. The speed of computation is limited only by the operating speed of the basic circuits and it is not affected by the carry time of the adder. When carrying out multiplication, addition and subtraction, the positive or negative sign of the numbers being computed need not be known. When the accumulator performs many additions and subtractions, as long as the total sum does not overflow, partial overflow will not affect the accuracy of the results of computation.

The design parameters of the digital wave filter are listed in Table 1. Using the domestically manufactured TTL integrated circuit (the time lapse of the "NAND" gate should be smaller than 10 ns, the time lapse of the trigger should be smaller than 30 ns) calculator set can provide 16 channels for multiple use. Practice has already proven that the function of the hardware built in this way is stable, and the characteristics of the filter satisfy the theoretical requirements.

#### IV. Extraction of the Basic Frequency and Determination of Unvoiced and Voiced Sounds

Extraction of the basic frequency is performed by computing the duration of occurrence of the polar values of the wave form and a computer that searches for the basic frequency. Its operating principles and details of computational procedures have been expounded in specialized documents. Its basic characteristic is the use of four narrow band digital wave filters to search for the basic frequency and then the peak values of the wave form are extracted, computed and a logical decision is made. It can be seen from Figure 5. The output from the four narrow band digital wave filters is the minuend. It is fed back to the subtractor. The output is then delayed for one sampling cycle by the shift register I and becomes the subtrahend and is also fed back to the subtractor. The two perform subtraction in series, and the symbol of the difference is accessed from the last digit and stored in the symbol register. When the symbol register changes its state, a peak value appears. The positive jump at the Q terminal of the register and the corresponding time sequence signal are used to drive one of the four label registers connected to it as a negative peak value label. When any one of the eight label registers described above is given data, the eight-digit counter's output "AND" gate is started. A group of digital codes is output. This is the time when a peak value of the wave filter of a certain circuit appears. To eliminate peak values of nonbasic frequencies which may possibly appear, the shift register II stores the amplitude of the peak value of the digital wave filter of the first circuit. Shift registers III, IV separately store the amplitudes of the positive and negative peak values of that circuit that have occurred previously. The reason that the peak value label is retained is when a positive peak value occurs, its amplitude is larger than half the amplitude of the previous peak value, and when a negative peak value appears, its amplitude is smaller than half the amplitude of the previous peak value, otherwise, it should be deleted.

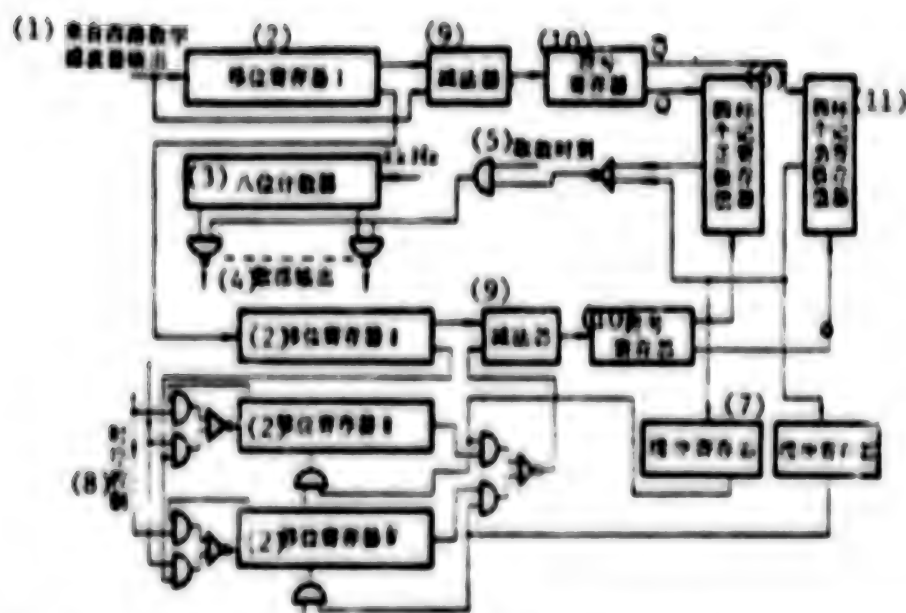


Figure 5. Principle of Calculator for the Time of Occurrence of Peak Values of Wave Forms

Key:

- |  |  |
|--|--|
| (1) Output from the four-channel digital wave filter | (7) Buffer register                              |
| (2) Shift register I                                 | (8) Time sequence control                        |
| (3) Eight-digit counter                              | (9) Subtractor                                   |
| (4) Data output                                      | (10) Symbol register                             |
| (5) Time of data accession                           | (11) Label register of four negative peak values |
| (6) Label register of four positive peak values      |  |

The special computer used to search for the basic frequency was designed by ourselves. Its basic characteristics are: (1) It uses a fewer number of devices to reach a higher processing speed. The central processing unit consists of 4 sets of data registers of a word length of 10 digits, a set of commands register of a word length of 16 digits, a 1 digit full adder, 4 sets of commands decoders and some logic control gates. Performing one addition of 10 digits requires 2.6  $\mu$ s, performing one division for an eight-digit quotient requires 20.8  $\mu$ s; (2) The function of the microcommands are fully utilized, the word length of the command words is 16 digits, separated into 5 syllables. They can be combined to form 29 different commands according to the needs of the program. Each command has a stronger function. For example, when performing division, the division command only has to be repeatedly executed 8 times. (3) There is a special purpose hardware index register which hastens computations.



## V. Synchronization of Coding and Decoding

The main function of coding is to further compress data. The method is as follows. Frequency spectrum analysis has 12 channels, the linear dynamic range of each channel represented in numbers should be from 1 to 512. Let 512 be 42 dB, take 3 dB as a quantum level, then the length required after logarithmic coding is only 4 digits. Assume the frequency spectrum is sampled 50 times per second, then the information transmission rate required to transmit the frequency spectrum envelope is  $12 \times 4 \times 50 = 2400$  b/s. To reduce redundancy, we also used the technique of unification of the maxima, i.e., the unified value of adding one channel to transmit each frame of the frequency spectrum. The method of computation is as follows: Let the maximum value of each frame of the frequency spectrum envelope be  $H_{\max}$ , its unified value is  $H$ , then when

$$\left. \begin{aligned} H_{\max} - 21 \geq 0, H &= H_{\max} - 21 \\ H_{\max} - 21 < 0, H &= 0 \end{aligned} \right\} \quad (4)$$

At this time, the form of the code group transmitted is:

1. Unified value:  $H$
2. First channel:  $H_1 - H$
- ...
3. Twelfth channel:  $H_{12} - H$

Because the dynamic range is only half of the original, the coding length needed is only 3 digits. Thus the information transmission rate required is  $13 \times 3 \times 50 = 1950$  b/s. Using the statistical characteristics of linguistic signals, the 9th to 11th channels use only 2-digit codes, the 12th channel uses one-digit codes, thus the speed can be reduced to 1700 b/s. The basic frequency and the unvoiced/voiced decision data use 7-digit codes, sampling 100 times per second requires a total of 700 b/s, thus the total information transmission speed is 2400 b/s.

When decoding, the unified values  $H$  and  $(H_1 - 12 - H)$  are added to reinstate the frequency spectrum values of each channel. But the dynamic range of each frame of the frequency spectrum is only 21 dB.

To enable the vocoder to be connected to various kinds of data transmission devices, this system ingeniously utilized certain characteristics of the linguistic signals to establish synchronization. If the data transmitters at the transmitting and receiving ends have already established synchronization, then at the vocoder transmission end, the 2400 Hz data transmitter clock frequency is split. The 50 Hz obtained is used as the beginning for each frame and as the signal for accession of data of the frequency spectrum and the basic frequency.

Because it is asynchronous with the time sequence of the vocoder, the number of sample points accumulated in computing the frequency spectrum may not be exactly one frame (each frame has 160 sample points). There may be one more or one less, but the error thus caused does not affect the linguistic quality. This method enables the vocoder and the data transmitter at the transmitting end to operate synchronously.

To establish synchronization of the transmitting and receiving ends, a label signal is sent from the transmitting end at the beginning of a call. The receiving end receives that label signal and compares it to the local frame signal, and sets the frequency splitter to clear "0." This automatically adjusts the frame signal to become synchronous with the transmitting end. As soon as synchronization is established, a high speed shift is carried out to access data from the buffer register, thus obtaining the correct data for restructuring the language. But because the data transmitter at the receiving end and the vocoder do not use the same clock, the long-term accumulation of errors may add one frame or lose one frame. But because the linguistic signals have a very strong correlation, the parameter between two frames varies very little, the added frame can be deleted and the loss of one frame can be supplemented by insertion. Thus the linguistic quality is almost unaffected. Practice proves that not relying on the clock for synchronization but using the characteristics of the linguistic signals to establish synchronization produces better results. Of course, the more accurate the standard nominal frequency of the crystal controlled oscillators of the vocoder and the data transmitter, the better the results.

## VI. Digital Language Synthesizer

The language synthesizer is composed of the excitation source, linear inserter, multiplier and accumulator.

### 1. Excitation Source

When the unvoiced/voiced determination yields an unvoiced sound, the random number generator<sup>23</sup> is started and its mathematical expression is:

$$x(n) = T_p [x(n-1) \oplus x(n-2)] \quad (5)$$

where  $T_p [\cdot]$  represents the right handed P digit, usually P is taken as 1.

$\oplus$  represents "exclusive OR" computation. The word length L is different and the cycle of the random number column is different, when we select  $L = 11$ , the cycle of the random number column is 33825. If the sampling speed is 8000 Hz, equivalent to 4.022s, compared to the unvoiced sound that lasts for several dozen milliseconds, it can approximate random noise. The logic diagram of the hardware is shown in Figure 6. When the gate control signal opens gate A, and gate B is closed, a new random number is generated. Then gate A closes and gate B opens. The random number undergoes circular shift 12 times to achieve the goal of multiplex multiple use. The initial state of the two sets of registers is  $x(n-1) = 0$ ,  $x(n-2) = 1$ .

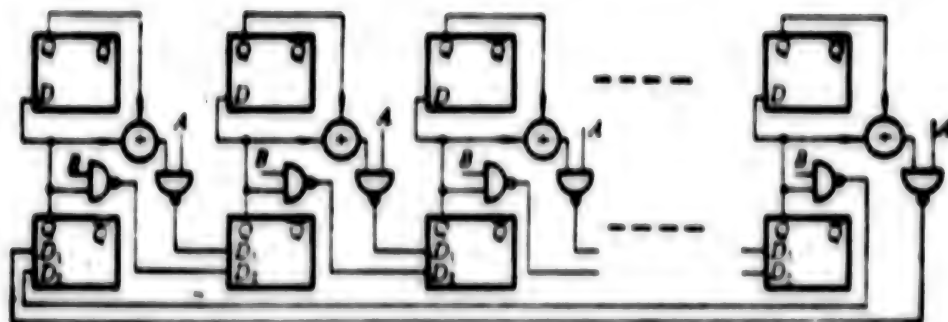


Figure 6. Logic Diagram of the Hardware of the Random Number Generator

When unvoiced and voiced sounds are being determined, the stepped triangular wave generator being started is shown in Figure 7. The counter begins to count from zero. When the number shown by the counter is equal to the cycle of the basic frequency (expressed by the number of sample points), the output of the 7 "exclusive OR" gates 1 to 7 is all "1," the output of the NAND gate is a low electrical balance, so the counter is cleared to "0" and it begins recounting, and the trigger is set at 9, driving the decoder to generate the spaced pulse of the fundamental tone shown in Figure 7.

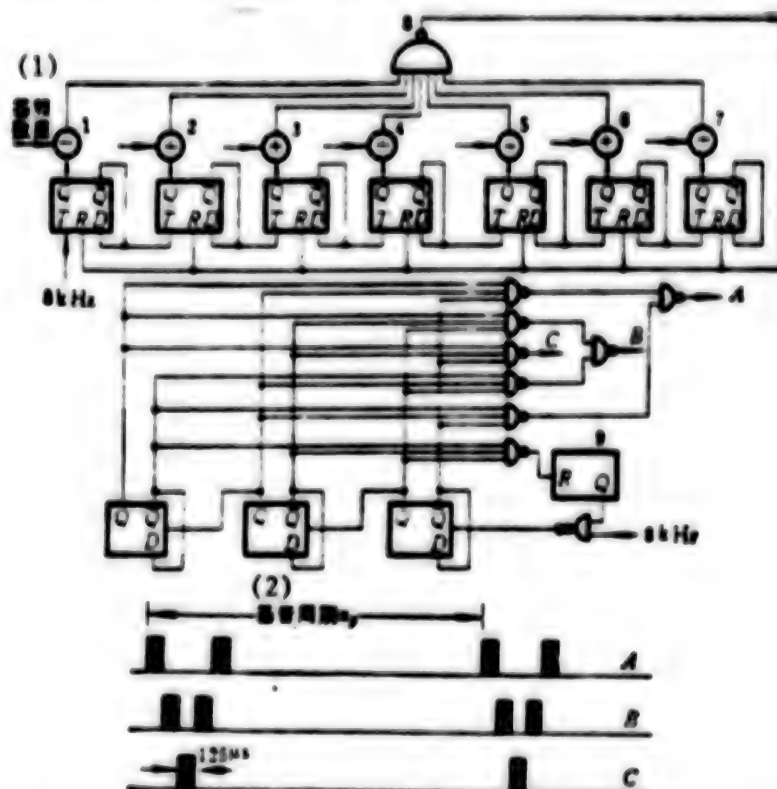


Figure 7. Principle of Generator of Spaced Fundamental Tones and Wave Form Diagram

Key:

(1) Base frequency data

(2) Fundamental tone cycle

To process the three groups of spaced pulses A, B, C shown in Figure 7 into the tower shaped wave, the following formula can be used for computation:

$$\frac{80}{N} [h^2 + 2 \left(\frac{h}{2}\right)^2 + 2 \left(\frac{h}{4}\right)^2] = 4.375 \times 10^5 \quad (6)$$

where N is the number of sample points between the basic frequency pulses; h is the amplitude of the tower shaped wave. In the above formula, the left and right sides of the equation are respectively the tower shaped wave and the energy of the random numbers of 80 sample points. Since it involved numerical computation, it was unnecessary to consider the dimensions.

To make the hardware simple, the relationship between h and N (see Table 2) can be realized by the coding and decoding network when the linguistic quality is not visibly affected.

Table 2. Relationship Between h and N

h	576	512	448	383	320	256
N	113~91	90~71	70~53	52~38	37~26	25 below

Figure 8 is the logic diagram of automatic adjustment of h along with N. The data output by the coding and decoding network is fed back to the shift register chain. Under the effect of the fixed time pulse and using the basic frequency pulses A, B, C of Figure 7 to control the "OR" gate, each shift transmits one sample point value of the tower shaped wave. After using it 12 times, the shift register is cleared to "0," the coding and decoding network inputs new data again. In this way, the desired tower shaped wave can be obtained.

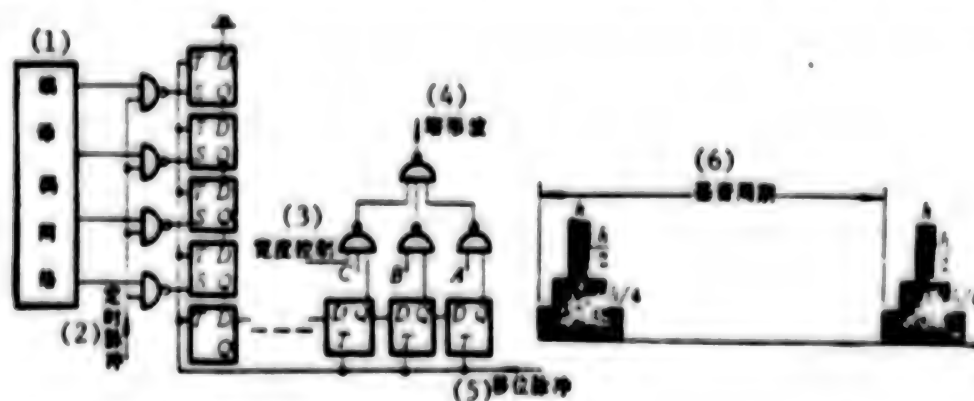


Figure 8. Logic Diagram of Automatic Adjustment of Amplitude Values h of Tower Shaped Waves Along With Base Frequency Cycle N

Key: (1) Compilation code network (4) Tower shaped wave  
 (2) Fixed time pulse (5) Shift pulse  
 (3) Width control (6) Fundamental tone cycle

## 2. Linear Inserter

To prevent the occurrence of sudden changes between two frames of the frequency spectrum, a linear inserter is needed. Let the frame of the frequency spectrum prior to the  $k$ th channel be  $A_j^k$ , the current value is  $A_{j+1}^k$ , the interval between the two frames of the frequency spectrum is 20 ms, then the inserted values corresponding to the values of the 160 sample points are:

$$A_{jp}^k = A_j^k + (A_{j+1}^k - A_j^k) \frac{p}{160} \quad (7)$$

where  $p = 1, 2, \dots, 160$  is the serial number of the sample point in each frame;  $k = 1, 2, \dots, 12$  is the serial number of the channels,  $j$  is the serial number of the frame.

To avoid division and make it easy to build the hardware, the 160 sample points can be divided into 32 equal parts, insertion is done for every 5 sample points (as shown in Figure 9). In this way we can obtain:

$$A_{jq}^k = A_j^k + (A_{j+1}^k - A_j^k) \frac{q}{32} \quad q = 1, 2, \dots, 32 \quad (8)$$

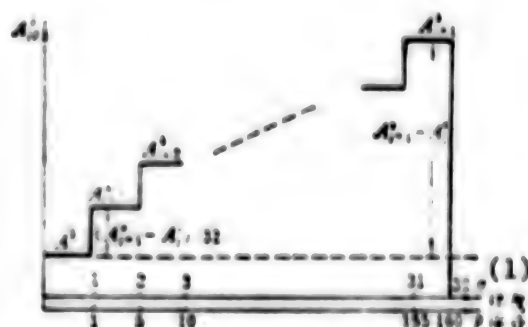


Figure 9. Sample Values of the Frequency Spectrum After Linear Insertion

Key:

(1) Sequence number of sample points

When a new frame of the frequency spectrum is input,  $(A_{j+1}^k - A_j^k)$  is first computed, then  $A_{jq}^k$  is computed: 32 can be realized by shifting. As long as there are an intermediate memory and correct time control signals, a one digit calculator used many times repeatedly can perform and complete all computations of linear insertion.

## 3. Multiplier and Accumulator

The output of the excitation source serves as the multiplicand (represented by  $Y_{jp}^k$ , 16 digits) after passing through the digital wave filter, the amplitude



value of the frequency spectrum serves as the multiplier after linear insertion (represented by  $A_{jq}^k$ , word length is 9 digits), the amplitude values of the sample points of the synthesized linguistic signals are:

$$S(p) = \sum_{k=1}^{12} Y_{jp}^k \times A_{jq}^k \quad (9)$$

After multiplication, the first 10 digits of the 25-digit product obtained by multiplication are cumulatively added, thus, one sample point of the synthesized language is formed. Afterwards, it can be converted to an analog quantity by the digital-analog converter.

#### VII. Evaluation Test Was Conducted in Two Stages

The first stage was conducted in the laboratory. The quality of the synthesized language was tested and studied. The second stage involved connecting the vocoder to a 4000 km communications channel ring, and using it as a single machine to simulate actual use. Both tests used the method described in reference.<sup>24</sup> Test materials included syllable list, word list, sentence list and short text. Ten to 12 radio operators between 17 and 35 years of age with normal hearing were selected for the testing team. During the test, the announcer recited the materials for the experiment in an acoustically prepared telephone booth. The original spoken sounds were processed by the vocoder or were transmitted by the vocoder, or the data transmitter over the 4000 km of communications channel ring and processed. The listener used earphones to listen and record. Because of the differences in the dialects of the mother tongues of the listeners, the score received in the test was lower than the score given by the standard listening test teams. For this, we used the Fletcher formula<sup>25</sup> to correct the test results, i.e.,

$$A_1 = \frac{v}{K} \lg(1 - Z) \quad (10)$$

where  $A_1$  is the index of clarity;  $Z$  is the degree of linguistic clarity;  $K$  is the skill factor of the experimental team;  $v$  is the ratio constant, and based on massive experiments in Chinese, we have taken  $v = 0.465$ .

During the experiment, the highest clarity of the original language  $Z = 0.969$ , if we assume at this time  $A_1 = 1$ , then  $K = 0.7$ . Thus, for the given experimental team, the correlation equation is:

$$A_1 = -0.664 \lg(1 - Z) \quad (11)$$

Measurements of indoor experiments yielded  $Z = 0.638$ . Substituting it into equation (11) we obtained  $A_1 = 0.293$ . According to the relationship<sup>25</sup> between  $A_1$  and clarity of syllables  $S_1$  we found  $S = 0.63$ , then based on the relationship<sup>25</sup> between the understandability  $J$  of the single sentence and  $S$ , we found  $J = 0.90$ .

After the indoor experiment, we made partial improvements on the vocoder and performed a communications channel experiment and measured  $Z = 0.648$ , substituting this into equation (11) we obtained  $A_1 = 0.324$ ,  $S = 0.65$ ,  $J = 0.93$ . All the results of the experiment are listed in Table 3.

Table 3. Results of Evaluation Experiments of the 2400 b/s Vocoder

	Working Condition	
	Indoor Experiment	Telecommunications Experiment
<b>S (percent)</b>		
Original value	43.4	47.0
Corrected value	63.0	65.0
<b>Understandability W of single words</b>		
Original value	58.3	58.2
Corrected value	76.0	78.0
<b>J (percent)</b>		
Original value	75.2	87.3
Corrected value	90.0	93.0
Short text	91.8	91.0

The ability to recognize the characteristics of the announcer was also an indicator to evaluate the vocoder. Until now there has not been any seasoned testing method. In this experiment, we only allowed the listener to identify among 10 familiar announcers who was reciting. Table 4 lists the percentage of listeners who could correctly identify the voice.

Table 4. Ability To Recognize the Characteristics of the Announcer Via the 2400 b/s Vocoder [in percent]

Working Condition	Syllable List	Word List	Sentence List	Short Text
Male and female average	86	82	92.5	90

Naturalness was not scored. The testing team generally believed that the synthesized language of this vocoder did not contain sounds from metals, distortion, hoarseness, the sound was natural, but it sounded depressed and indistinct.

The sound spectra of the original language and the synthesized language are shown in Figure 10. [not reproduced]

When the vocoder operates on the short wave radio communications channel, the quality of the synthesized language will be affected because of the higher error rate of the communications channels. The quantitative relationship among them is a problem of concern to many people. We performed experiments on the wire communications channel ring by manually changing the error rate. The results are as follows: When the error rate was smaller than  $10^{-4}$ , the quality of the synthesized language of the vocoder was not affected. When the error rate was  $2.8 \times 10^{-3}$ , S dropped by 14.1 percent, W dropped by 14.5 percent, J dropped by 2.3 percent; when the error rate was  $1 \times 10^{-2}$ , S dropped 28.9 percent, W dropped 20.4 percent, J dropped 5.4 percent. It can be seen that errors of communications channels affect the syllable clarity and understandability of single words relatively greatly, but affect understandability of sentences and short text very little.

The research work was carried out under the guidance of Professor Ma Dayou [7456 1129 3731], Assistant Professor Zhang Jialu [1728 1367 7498], and completed together by Yuan Jinren [5913 3160 3387], Wang Tianxiang [3769 1131 4382], Zhao Yilong [6392 0001 7893], He Rong [0149 1369], Xia Xiuping [1115 4423 5493], Wang Jingjing [3769 2533 2533], Yin Xiufen [1438 4423 5358], Liu Quansiang [0491 0356 4382], Song Meizheng [1345 5019 3791], and Song Zhiyong [1345 4249 3938]. Comrades of the design department of the Changzhou Radio Plant participated in the manufacturing of the prototype machine and communications channel experiments.

#### REFERENCES

1. C. E. Shannon, Proc. IRE, Vol 37, Jan 1949, pp 10-21.
2. M. R. Schroeder, Proc. IEEE, Vol 54, May 1966, pp 720-734.
3. J. L. Flanagan, IEEE, Trans., Vol Com-19, No 6, Dec 1971, pp 1006-1020.
4. B. Gold and C. N. Rader, IEEE Trans., Vol AU-15 Dec 1967, pp 148-161.
5. Xu Huanzhang [1776 3562 4545], "Average Frequency Spectrum of Vernacular Chinese," SHENGXUE XUEBAO [ACOUSTICS JOURNAL], Vol 2, No 4, 1965.
6. Wang Rensheng [3076 3387 3932] et al, "Chinese Language Signals and Their Rate of Change, Measurement of the Distribution Density of One Dimensional Probability," Collected Papers of the First National Professional and Academic Conference on Information Theory, 1964, pp 132-142.
7. Zhang Jialu [1728 1367 7498], Ma Dayou [7456 1129 3731], "New Method of Deriving the Index of Clarity," SHENGXUE XUEBAO Vol 2, No 2, 1965.
8. R. M. Golden, "Vocoder Filter Design: Practical Consideration," J.A.S.A., Vol 43, 1968.
9. C. N. Rader, "Spectra of Vocoder Channel Signals," J.A.S.A., Vol 35, 1963.



10. Li Changli [2621 2490 4539], Song Zhiyong [1345 4249 3938], Zhao Yilong [6392 0001 7893], "A New Method of Extracting the Base Frequency From Linguistic Signals," *SHENGXUE XUEBAO*, No 1, 1979, pp 12-22.
11. Yuan Baozong [5913 0202 1350], "Method of Extraction of Linguistic Information, Collected Papers of the First National Professional and Academic Conference on Information Theory," 1964, pp 122-131.
12. Jerzy. Goraki-Popiel, AD/A: 045079, 1977
13. Thomas H. Crystal, AD-690179, 17 May 1969.
14. G-AE Concept Subcommittee, on digital filtering, *IEEE Trans.* Vol AU-16, Sep 1968.
15. C. M. Rader, B. Gold, "Digital Filter Design Techniques in the Frequency Domain," *Proc. IEEE*, Vol 55, No 2, 1972.
16. C. S. Weaver, "Digital Filtering With Application to Electrocardiogram Processing," *IEEE Trans.* Vol AU-16, Sep 1968.
17. R. K. Otnes, L. P. McNamee, *IEEE Trans.*, Vol AU-18, Dec 1970, pp 456-463.
18. L. B. Jackson, "An Approach to the Implementation of Digital Filters," *IEEE Trans.*, Vol AU-16, Sep 1968.
19. Vocoder Group of the Ninth Laboratory of the Physics Institute of the Chinese Academy of Sciences, Principle, Design and Construction of the Digital Wave Filter, *Radio Communications Technology*, 1976, No 2.
20. Yuan Jinren [5913 3160 3387], Mo Fuyuan [5459 4395 3293] et al, "Hardware of the Recursive Multiplex Multiple Use Digital Wave Filter," Paper of the Second National Academic Conference on Acoustics, May 1979.
21. B. Gold, L. R. Rabiner, "Parallel Processing Techniques for Estimating Pitch Periods of Speech in the Time Domain," *J.A.S.A.*, Vol 46, Aug 1969, pp 442-448.
22. L. R. Rabiner, M. J. Cheng, A. E. Roseberg, C. A. McGonegal, *IEEE Trans.*, Vol ASSP-24, Oct 1976, pp 399-417.
23. C. M. Rader, L. R. Rabiner, R. W. Schafer, "A Fast Method of Generating Digital Random Numbers," *BSTJ* Vol 49, No 9, Sept 1970.
24. Zhang Jialu [1728 1367 7498], Ma Dayou [7456 1129 3731], "Understandability of Vernacular Chinese," Graduate Thesis of the Chinese Academy of Sciences, June 1963.
25. H. Fletcher, "Speech and Hearing in Communication," McGraw-Hill, New York, 1953.
26. Zhang Jialu [1728 1367 7498], Song Meizhen [1345 5019 3791] et al, "Diagnosis and Evaluation of the Quality of the Vocoder," Paper of the Second National Academic Conference on Acoustics, May 1977.

DESIGN, BUILDING OF PASCAL-655 SELF-COMPILING SYSTEM OUTLINED

Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, Sep 80 pp 14-24

[Article by Wang Yicheng [3769 5030 6134], Chen Hansheng [7115 3211 3932], Wang Jiazeng [3769 1367 1073], and Shao Zhenhao [6730 5271 3185]: "Design and Building of the PASCAL-655 Self-Compiling System." This article was received in December 1979]

[Text] (Abstract) This article is about the development of the PASCAL-655 self-compiling system. It describes the principles for determining the text of the language, the method to realize compilation and the process of self-compilation. Emphasis has been placed on the discussion of the design of the target structure and translation of expressions. This system is written in its own language, and has been implemented on the 655 machine.

1. Foreword

Since the time the concepts of "software engineering" and "design of structured programs"<sup>1</sup> were proposed, great changes have taken place in program designs. Various kinds of new structured types of high level program designing languages have emerged one after another. Many systems software programs in high level languages using the step wise precision method have already been actually used. But, how to improve the reliability of the software and how to significantly improve the production rate of software are still important topics that command a lot of attention.

Systems software can generally be divided into two main categories: One category is the operating system characterized by its ability to process simultaneously occurring problems. The other category is the compiling system that is characterized by its ability to process sequential problems. Because we are still unclear as to the operating efficiency of the operating system written in high level languages and because of the close relationship between the operating system and the actual mechanical devices upon which the system depends, greater difficulties may be brought to bear upon transplanting. In addition, to do away with the old habits and to change to the use of high level languages for writing programs require continuous exploration and accumulation of experience in use. Therefore, we have decided to first set up a self-compiling system on the 655 machine, making it easy to change and expand for the main purpose of writing compilation programs and for establishing the ability to write other software programs. It is hoped that the system can be put to use as soon as possible.

The fundamental purpose of the system is that the functions of the language are appropriate in scale and the functions can be realized effectively on the 655 machine, and that the system has a higher reliability and that it is easy to use, maintain and transplant.

## 11. Consideration of the Totality of the System

This section will only discuss the reasons for certain decisions in the design for realizing the established goals.

### 1. Principles of Determining the Text of the Language

(1) Functions of Appropriate Scale. When designing a self-compiling system, the first problem encountered is how to determine the text of the language. Obviously, PASCAL<sup>6,11-13</sup> is a very successful language established on the principles of structured program design. It has been successfully implemented<sup>10</sup> on 57 series of computers, and this trend is still continuing to develop. We believe it can be directly used as the blueprint for our primary language. To realize self-compilation, we must first establish a workable system, to use it to clarify workability of high level languages which have already been proven by others but which we have yet to grasp. Therefore, we have deleted from the original report such concepts as real number types, explanations of functions and compact representation of data that are not greatly related to our goal, so that the language is maintained at a basic PASCAL level. We believe such reductions will not cause too much difficulty for writers of systems software.

(2) Care Must Be Taken in Making Partial Changes. Because we have not seen the standard PASCAL language text, we have indeed discovered its shortcomings in the course of studying and learning the original report. Thus, based on the actual situation of the 655 machine, and without affecting the framework of the whole, partial additions and deletions have been made. For example, Haberman pointed out that in the original report, there were many places where the limitations on data types were not precise enough.<sup>9</sup> He made some changes in the definition of the system of types in the PASCAL-655 language, as shown in Figure 1.

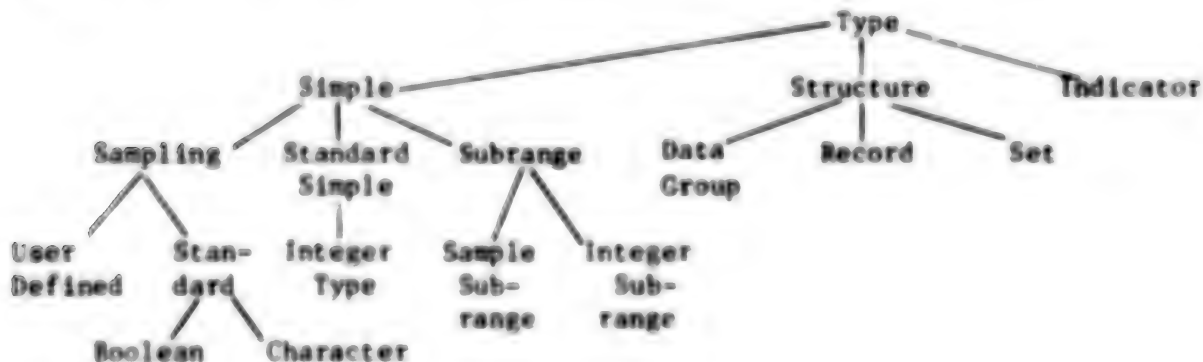


Figure 1. Syntactic Tree of the Definitions of Types

Here, the sampling type is understood as:

`<sampling type>:: = (<identifier> [, <identifier>])`

We have included the Boolean type and the character type in the sampling type. This reflects their type characteristics and also makes the classification of the types seem more natural. Because the integer data type is different from the samples and subrange types in attributes, therefore it is considered as a single item of the sample type. Again for example, because the control system of the 655 computer is not perfect, and to make sure that the system can operate more effectively, we have discarded the files concept in the original report and substituted it by direct read/write statements and printed statements, and we introduced the concepts of type equivalence and type compatibility, thus clarifying the imprecise or confusing points<sup>6</sup> in the definitions of data types in the original report.

(3) Adaptability to Low Level Languages. Because the usability of the language and operating efficiency of the product lack necessary sensitivity, we have decided to add the concept of coded statements in the language. To solve the problem of communication between the PASCAL language programs and the programs of coded statements, we systematically set up a work area (abbreviated AT variable area) of a maximum of 4906 machine words, the user can directly assign addresses to variables in that area in the description of variables, and these variables are regarded as full range. In this way, a simple and clear path is provided for the transmission of messages between a high level language and a low level language.<sup>2</sup>

After such additions and deletions, this article provides a way suitable for writing ordinary compilation programs. The compilation program of PASCAL-655 itself is written in this language.

## 2. Realization of Compilation

(1) General System. For convenience to the user, versatility of the system and efficiency of operation of the target program, we have divided the entire system into three parts, an editing program, a translation program and an operating program. The editing program provides conveniences for the user to edit on the first level source program, and the text of the source program that is easily readable can be printed out according to the needs of the user. The translation program is the main body of the entire system. It conducts an overall check of the syntax of the source program and converts it into an equivalent and executable target program, and prints out lists of all kinds of messages needed by the user. The operating program is the necessary support for improving the efficiency of operation of the target program (spatial and time). The compilation flow chart of the source program is illustrated in Figure 2. The translation program is divided into three parts, lexical analysis, descriptive processing and statement processing. Figure 3 illustrates the relationship among them. The main task of lexical analysis is to convert the character sequence of the source program into easily processed sequence of lexical units, delete comments and perform lexical checks. The main task of descriptive

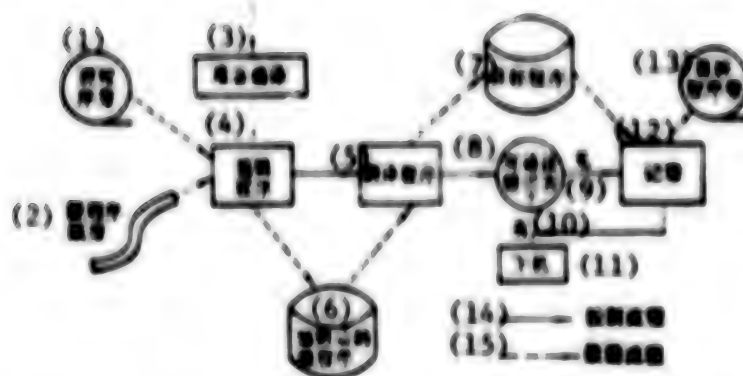


Figure 2. Compilation Process of the Source Program

Key:

- |                                  |                                       |
|----------------------------------|---------------------------------------|
| (1) Source program tape          | (8) Are there any syntactical errors? |
| (2) Source program paper tape    | (9) No                                |
| (3) Ready for compilation        | (10) Yes                              |
| (4) Editing program              | (11) Off line                         |
| (5) Translation program          | (12) Record tape                      |
| (6) Source program after editing | (13) Target program tape              |
| (7) Target program               | (14) Control process flow             |
|                                  | (15) Data flow                        |

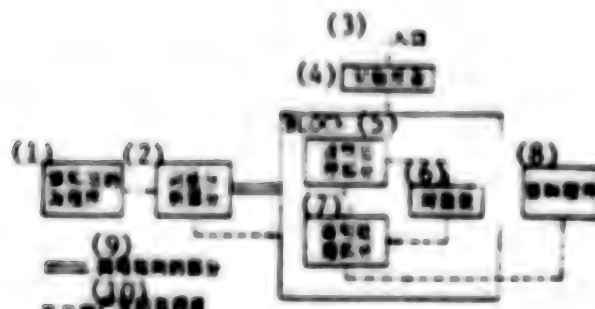


Figure 3. Relationship Among the Various Parts of the Translation Program

Key:

- |                                  |                              |
|----------------------------------|------------------------------|
| (1) Source program after editing | (6) Objects list             |
| (2) Lexical analysis             | (7) Statement processor      |
| (3) Entrance                     | (8) Target program           |
| (4) Initial preparation          | (9) Command call             |
| (5) Description processor        | (10) Data flow thus produced |



processing is to establish an objects list according to the definitive descriptions of the identifiers for storage and distribution and for checking the definition of the identifiers. The main task of statement processing is to use the messages provided by the object list to generate an executable target program according to the definitions of the language, and perform checks on the applicability of the identifiers.

(2) Method of Translation. One of the important goals the designers of the PASCAL language sought was efficiency of compilation. This means, it can be realized via scanning once. Although according to the original report<sup>6,8</sup> some problems existed in realizing one scanning, this can be realized very well with slight changes. For the 655 machine which has a relatively large internal memory and which is a high speed computer, using a plan of scanning once to realize compilation and improve the efficiency of compilation is feasible. This is because accessing external memory many times means an increase in the time of compilation. In addition, we also placed the entire target program generated machine command codes, not generation of intermediate codes, to assure that the compilation process can more quickly be completed. For such a language as PASCAL which is recursive, the main reason we used the method of translation for recursive subroutines is:

(i) It coincides with the design principle of top-down development advocated by the design of the structured program;

(ii) Partial change of the language will not bring about disastrous results to the entire compilation program;

(iii) The translation program does not require various types of stacked structures to handle recursive activities. The relationship between modules is visual and easily understood;

(iv) It is convenient for the programmer to test and prove the accuracy of computation informally and according to engineering know-how.

(3) Description of the Various Objects in Translation. In the course of translation, because syntax has to be checked and target codes have to be generated, the attributes of the objects being processed must be known. We have placed the names of the various kinds of identifiers in the source program and their attributes together in a so-called "object list".<sup>1</sup> It is established when processing the description of the source program and it is used when generating the target codes. Because the data types of the PASCAL language are more complex and the attributes of the objects of different types are vastly different, therefore the objects list can be very appropriately expressed by records with variables. The following gives a detailed description of the objects list. For ease of understanding the meaning of each term, we changed the identifiers of the object list to names written in Chinese characters.

TYPE identifier types = (type, label, constant, variable, procedure area, designation area, variable component, standard procedure, standard function);

Type format = (sample, subrange, record, set, indicator, type not defined);

Forms of identifiers of constants = (sample value, nonsample value);

Lists of types of constants = (integers, strings);

Object list = RECORD

Name type =: ALFA;

CASE type: (size: identifier type OF

Type: (size: INTEGER

Name equivalence chain: +Object list;

CASE form: type form OF

Sample types: (First sample value: +Object list;

Number of Sample values: INTEGER)

Subrange types: (Master: +Object list;

Lower range, upper range: INTEGER);

Data group types: (lower identifier type, composition type:  
+Object list);

Record type: (First area of record, record designator area:  
+Object list);

Set type: (Basic type: +Object list);

Designator type: (Element type +Object list);

Type undefined: ( ));

Label: (Whether defined, whether Sealed; BOOLEAN;

Entrance address: INTEGER);

Constant: (Constant type: +Object list;

CASE constant form: Constant identifier form OF

Sample value: (succession: +Object list;

Value: INTEGER);

Nonsample value: (CASE constant type: Constant type list OF  
Integer: (Value: INTEGER);

Strong: (String value: ALFA)));

Variable: (Variable type +Object list;

Number of levels of variables: 0 .....6

Variable address: INTEGER

Replacement parameter negation: INTEGER);

Procedure: (First formal parameter: +Object list;

Number of parameters: INTEGER;

Forward reference negation: BOOLEAN;

Number of nested levels: 0 .....5

Serial number: INTEGER;

Size of data segment: INTEGER);

Range: (Range type: +Object list;

Range address: INTEGER);

Designation range: (Designation types: +Object list;

Address of designation range: INTEGER;

First variable body: +Object list);

Variable body: (First range of variable body: +Object list;

Variable body's designation range: +Object list);

Standard procedure: (Entrance address: INTEGER);

Standard function: (Formal parameter type: +Object list;

Results type: +Object list)

END;

To compress the space of the internal memory taken up by the object list in the process of translation, consideration was given to conserving computation. All object lists are dynamically generated, i.e., when a definition of an identifier occurs, the NEW (P) is used to generate a record that depicts its attributes. When the descriptive processing of a process ends, all object lists that are partial to that process (except for the object list of the formal parameters) occupy the space occupied by dispose (P). In addition, because consideration is not given to the compact representation of the object lists, the individual attributes of the data objects can be relatively quickly accessed and thus hastening the progress of compilation.

### 3. The Self-Compilation Process

When the text of the language, the structure of the target program and the method of translation have been basically determined, we decided not to use the past method of first drawing the block diagrams and then write the program, but tried directly to use the determined language to write the program. The motivation for doing this is:

- (1) The usability of the text of the language set can be further examined by using the PASCAL language to write a compilation program on our own.
- (2) We wanted to try the possibility of changing the method of design of programs.

During the whole course of writing the program, we intentionally used the various components provided by the language to gain a full understanding of and examine the function of the language.

When the entire system had been written in the language, we had to convert it to a corresponding machine command program manually first because a usable PASCAL translation program was still unavailable for the 655 machine. We called it the compiler 1. It is only a transient compilation program that is necessary for obtaining the final translation program. In the course of conversion, we intentionally deleted certain functions in the compilation program written in that language to reduce the amount of work of manual conversion and to hasten progress of research and development. To assure the accuracy of manual conversion, each part was converted as much as possible according to the predesigned target structure (at least the control of the entrance and exit of the processes). In this way, the specifications of each module can be uniform and this facilitates on-line debugging, and the accuracy of the designed target structure can be inspected during the debugging process.

After debugging compiler 1, the complete source program that has already been written is translated into the corresponding target program by it, thus obtaining the first usable compilation program. We call it compiler 2. Then, the original source program is used as the input for compiler 2, and through it, another compilation program, compiler 3, is generated. If compiler 2 and compiler 3 are entirely consistent, then the correctness of the self-compiling system has been proven and the predetermined task is completely accomplished.



If discrepancies are discovered, then there may be problems in carrying out the computation or there may be other mistakes. After the mistakes are found, revisions are made on the first level of the source program and compilation is done again until the final result is obtained. Figure 4 illustrates the entire process of self-compilation.

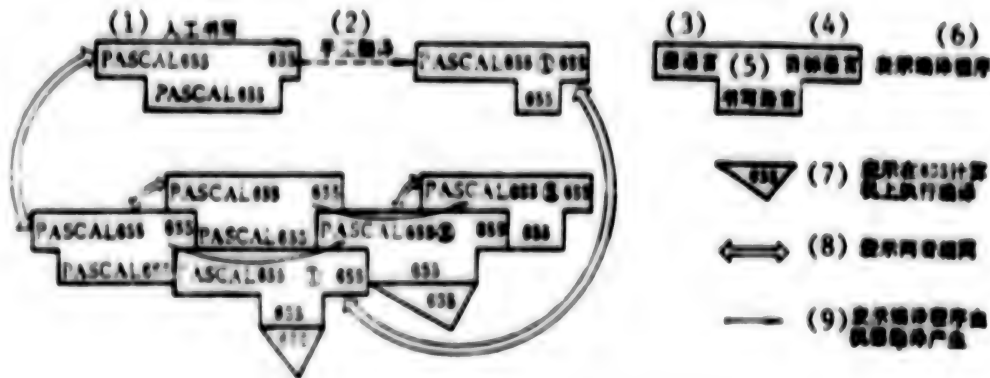


figure 4. Self-Compilation Process

Key:

- |                                 |   |
|---------------------------------|---|
| (1) Manually written            | (7) Indicates execution of compilation on the 655 computer                |
| (2) Manually translated         | (8) Indicates the two are the same  |
| (3) Source language             | (9) Indicates the compilation program is generated by machine translation |
| (4) Target language             |   |
| (5) Written language            |   |
| (6) Indicates compiling program |   |

### III. Design of the Target Structure

The process of using specific computer command groups to express the purpose of the program is called designing the target structure. It includes representation of data, methods of addressing various quantities, organization of data during operation of the target program, and designing suitable command groups to realize the purposes of the components of each language. The accuracy of this work will directly affect the accuracy of the system. Its quality will affect the efficiency during execution. As to accuracy of design, we relied upon static inspection and correct execution of the first compilation program (compiler 1). As to efficiency, we gave priority to the consideration of conserving the space occupied by the target program, then we considered the smallest possible cost to achieve the same results. Because, in an environment of a multiple channel program, the size of the compilation program itself greatly affects the efficiency of use of the entire computer system. The time spent for compilation is secondary to space, and at the same time, we gave appropriate consideration to measures that facilitate transplanting.

## 1. Data Representation

Because the demands for compressed representations of various types of data have been eliminated from the text of the language, all types of data are stored in the memory with the machine word as the unit. Their actual arrangement in the 655 computer is as follows:

Sample type: 

48	47	13	12	1
1	0	0	0	1

i is numerical order of the sampling value in the definition (beginning from 0).

Logic type: 

48	47	2	1
1	0	0	T

T = 0 represents FALSE, T = 1 represents TRUE.

Character type: 

48	47	9	8	1
1	0	0	Z	

Z represents the character code.

Integer type: 

48	47	41	40	39	1
1	0	0	f	W	

W is the integer value represented by a complement; f is the symbol, f = 0 represents a positive number, f = 1 represents a negative number.

Indicator type: 

48	47	19	18	1
1	0	0	P	

P is the beginning address of the indicated quantity in the internal memory, NIL is represented by the full "1."

Set type: 

48	1

The 8th digit represents the ith element in the set. "0" means this element is not included in the set, "1" means the element is included, the empty set is represented by the full "0."

Subrange type: Represented the same way as the type related to it.

Data group type: The component is taken as the unit occupying a group of continuous machine words. Representation of each component is determined by the type of the component.

Record type: The range is the unit occupying a group of continuous machine words. When a variable body is included, the volume of the largest variable body is used for calculation. The representation of each range is determined by the type of the range.

## 2. Addressing Method

All partial quantities (including parameters) of each process description make up the data segment of that process. It is distributed at the time when the process to which it belongs is tested and used and released after the testing and use end. The address of each variable can be distributed only according to the position of the origin of the data segment to which it corresponds and belongs during the time of compilation. Its real address is determined dynamically when the target program is operating, i.e., the origin of the data segment must first be determined before its address can be determined. In the recursive activities in processing, postponement of computation of the address of this type of variables is entirely necessary.

When the program is in operation, the time spent on computing the addresses of the variables directly affects the efficiency of execution of the target program. Therefore, efforts should be made to reduce such expenditures. A suitable method is to place the origin of the data segment currently being used in the variable index register and make necessary adjustments of the value at the entrance and exit of testing and using the process, thus effectively solving the problem of dynamic computation of the addresses of variables. Consideration has been given to the fact that the 655 machine has 16 index registers and the language has already limited the number of static nesting levels of the process to 5. We therefore used 5 index registers to store the origins of the data segments currently being used. The adjustments were performed by the operating program.

The address of the variables when the target program is in operation can be computed according to the following formula:

Absolute address =  $(b_{l+8}) + \text{relative address}$

where  $l$  is the number of the nested static level of the process,  $b_{l+8}$  is the corresponding index register. In the target program, single indexing commands can be used to realize calling of the variables.

## 3. Organization of Operations of the Target Program

The main unit of the structure of the PASCAL program is the process. The main program, like the process, corresponds to a segment of the program. We put all constants that occurred in the program together to form a data list, unlike the variables which belong to the various different processes, and we used a specific index register to fix the coordinates. This arrangement can save the space being occupied and can also provide conveniences for processing the translation part. To process the recursive activities of the processes, a chain working area was set up while the target program was in operation for recording the origins of data segments and the return address that should be protected. The

organization of the entire internal memory when the target program is operating is illustrated in Figure 5.

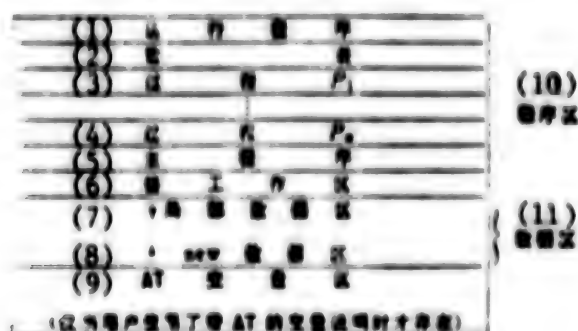


Figure 5. Organization of Internal Memory When the Target Program Is in Operation

Key:

- |                       |  |
|-----------------------|--|
| (1) Operating program | (8) Data area  |
| (2) Data list         | (9) AT variable area (Exists only when the user has used descriptions of variables with AT attached) |
| (3) Process $P_1$     | (10) Program area  |
| (4) Process $P_n$     | (11) Data area   |
| (5) Master program    |  |
| (6) Chain work area   |  |
| (7) Partial data area |  |

The number of index registers in the computer is limited, whether they are used rationally will also affect the function of the system. We define the distribution of the index registers while the target program of the 655 machine is operating as follows:

$b_1, b_2$ : Entrance address of the various processes or the main program for storage in the memory and the volume of the corresponding data segment.

$b_3$ : The head address of the chain work range.

$b_5$ : Address of the first empty unit of the partial data range.

$b_8 \sim b_{13}$ : Head address of the partial data segment of each level currently being accessed.

$b_4, b_6, b_7$ : Temporary work index register.

$b_{14}$ : Head address of the AT variable range.

$b_{15}$ : Index register specifically for the return address.

#### 4. Design of the Targets of the Components of the Language

The various linguistic components allowed to be used in the language must all be realized by the group of commands of the 655 machine according to semantics. Here, only the process description and process statements are used as explanatory illustrations.

The target structure of each process description corresponds to one closed subroutine. All formal parameters are processed as partial quantities of that process, and they are placed at the front of the data segment corresponding to this process. Each formal parameter uses one machine word. If it is a variable parameter, that machine word is used to store the head address corresponding to the actual parameter during execution. If it is not a variable parameter, that machine word is used to store the value corresponding to the actual parameter during execution.

The basic form of the target commands<sup>14</sup> of process description is as follows:

Res (<Process description>) =	Store A	b <sub>5</sub>	1	Preserve the last actual parametric value
	Store index	b <sub>15</sub>	0000	Remember return address
	Store index	b <sub>1+8</sub>	0001	Protect the value of the fixed coordinates of the origin of the data segment of the lth level, to appropriate internal memory for the data segments called this time, forming the value of the fixed coordinates of the origin of data segment of that process.
	Index transmission	b <sub>5</sub>	b <sub>1+8</sub>	
	Return <run subroutine>			
	Res (<statement>)			
	Index transmission	b <sub>1+8</sub>	b <sub>5</sub>	Release the internal memory being occupied by the data segment called this time, reinstate the value of the fixed coordinates of the origin of data segments of the lth level
	Return <run subroutine>			
	Send index	b <sub>1+8</sub>	0001	Execute return according to the return address
	Necessary return	b <sub>7</sub>		



The form of the target command of the process call:

Res (<Process statements>) =	$\left\{ \begin{array}{l} \text{Res (<Actual parameter> } 1) \\ \text{Res (<Actual parameter> } n) \end{array} \right\}$			When calling processings without parameters, there is no such command
	Send index	$b_1$	$d_k$	The entrance address of the process called is sent into $b_1$
	Return	$b_1$		
	Send index	$b_1$	$d_k$	Reinstate the value of the fixed coordinates of the entrance address of the process in which the called statement is located

Here, Res represents the target command group of the corresponding syntactical components,  $d_k$  and  $d_{-k}$  are respectively the unit address for storing the constant of the entrance address of the corresponding process.

## VI. Translation of Expressions

Expressions describe the actual operation the various quantities of the program should execute. This system follows the most ordinary method of conversion in realizing translation of expressions. Because of the desire not to have an overly large translation program, conservation of the various expressions is not given too much consideration.

In implementation, first, the priority levels computed in the syntactical diagrams of the expressions establish the corresponding processing modules (each module corresponds to one process). Each module processes the various actual computations in the same level. The recursion defined by the expressions determines the relationship among the modules which should be a recursive call relationship. Therefore using the recursive PASCAL language to describe it can make the structure of the computations for translation very simple, clear and precise. Then, based on the results of the design of the target structure, the demands on the depiction of the attributes of the various quantities are presented so that the set of attributes of the stipulated objects list can satisfy the requirements for generating the target commands. Finally, the actual details for the interior of each module is compiled and written.

Because the function descriptions in the text of the PASCAL-655 language has been deleted (standard functions have been retained), we have set up a specific working area in the inner memory for the target program to store the intermediate results of computation of the expressions during execution. Of course, when function descriptions are allowed, the possibility of recursive calls must be considered. The working area for storing intermediate results still must be placed together with the data segments of the function descriptions.

When realizing conversion of the actual computations in the interior of each module, we always handle it according to a canonical form, i.e., the following command group is always written and compiled.

LOADA	< X >		LOADA	< X >
LOADB	< Y >		LOADB	< Y >
	or OP	< Y >	or	
OP	< B >		RETURN	< OP run subroutine >
Store A	< W >		Store A	< W >

Here, < X > and < Y > can be the results of the expressions of constant quantities, variable quantities or intermediate quantities. < W > is the working unit storing the intermediate results. LOADA and LOADB represent installations of the values of the corresponding component quantities in adders A or B. OP is the computation to be executed.

The advantage of using canonical processing is that it is easy to implement, easy to understand, easy to transplant, and the storage space occupied by the target program can be compressed.

This processing method can generate extra intermediate memory commands. We have used a very simple method to eliminate all possible extra memory commands, and thus the length of the final target program will not increase.

Another important point in realizing translation is how to describe the attributes of the computed component quantities and intermediate results. As regards this question we introduced a full range variable RESULT of the VRT type. The data structure of VRT is as follows:

```

TYPE    VRT    = RECORD RT:      †Object list;
                      RI, RD, RJ: INTEGER
END;
```

Here, RT points out the entrance address of data type related to that component quantity in the object list. RI points out the number of the static nested level of the process description in which that component quantity is located. RD points out the address of the corresponding origin of the data segment relative to that component quantity. RJ points out the method of forming the absolute address of that quantity.

When compiling a binary computation, the attribute of the first component quantity is compiled and stored in the partial quantity of the translation module belonging to that computation. After the second quantity is compiled, its attribute is stored in RESULT. After this binary computation is compiled, the attribute describing the results of computation is stored in RESULT for later continuing compilation.<sup>9</sup>

Generating the codes that place the value of the components to be computed into the adders A or B is a basic operation of translation of expressions. Each processing module must use this kind of operation many times, therefore it is made into a specific module (called LOAD). It has two parameters. One points out to



which address, address A or B, the values are to be placed. The other points out the attribute of the component to be placed. When that module is called, a corresponding target command can be compiled on the basis of the message provided.

Three situations are related to the address of the component quantities: direct type, indirect type and index type. They are determined by RI, RD, RJ described by the attributes.

(1) Direct type:  $RJ = 0$ ,  $RD < 4096$  the unit address of the value is  $(RI) + RD$ , it can be realized by a single index command.

(2) Indirect type:  $RJ = 0$ ,  $RD \geq 4096$  the unit address of the value is  $RI + RD$ , it cannot be realized by one command, the command to compute the address must first be compiled, then the command for completing installation is compiled.

(3) Index type:  $RJ \neq 0$  the unit address of its value requires  $RJ - 1$  indirect accessions before it can be obtained. Of course, when computing the first indirect address, a command for computing the address corresponding to the situation of RD must be compiled and then the installation command can be compiled.

Work concerning this part involves actual machine commands and it will not be further discussed here.

#### V. Concluding Remarks

The total length of the source program of this system is 1,861 lines (one line may have more than one statement) and a total of 65,616 characters. A total of 84 processes are used, there are 70 full quantities, 279 partial quantities and 37 labels. The various data structures and statements provided by the text of the language is used in writing. The distribution of the above data in the translation program is shown in Table 1. Some statistical data on generating the compilation program manually or by self-compilation are shown in Table 2. It can be seen that the quality of the compilation program generated by the method of self-compilation, whether spatially or time-wise, is acceptable.

It is worth pointing out that this system still has to be perfected continuously in the course of use.

Table 1. Distribution of Various Data in the Translation Program

Types of Programs		Lexical Analyser		Description Processor		Statement Processor	
Item							
Number of lines		267		697		897	
Number of processes	0 level	11	11	28	23	45	4
	1 level		0		5		41
Number of full range quantities		24		18		28	
Number of partial quantities		16		106		157	
Number of labels		7		6		24	
Types of data used		All used except for record types, set types, lead unit types		All used		All used	
Number of State-ments	Assigned value		128		282		455
	Condition	295	55	839	159	1473	300
	Process call		56		256		539
	Other		56		142		179

Table 2. Some Statistical Data of Two Compilation Programs

Statistical Data	Compilation Program	Manually Generated (Compiler 1)	Self-Compiled (Compiler 2)
Total length (machine word)		26,199	27,772
Length of translation program		6,048	7,448
Length of operating subroutine		128	128
Length of editing program of the text		1,184	1,357
Length of objects list		2,455	2,455
Length of buffer zone of target codes		16,384	16,384
Time of compilation of source program		1' 47"	3' 24"

# REFERENCES

1. Tang Zhisong [0781 4460 2646] "Computer Application and Applied Mathematics," 1975, No 12, pp 9-26.
2. Chen Hansheng [7115 3211 3932] et al, PASCAL-655 Language Text, Huadong Computer Technology Research Institute, 1979.
3. N. Wirth, Software--Practice and Experience, Vol 1, No 3, 1971, pp 309-333.
4. U. Ammann, Software--Practice and Experience, Vol 7, No 3, 1977, pp 391-423.
5. J. Welsh, W. J. Sneeringer and C. A. R. Hoare, Software--Practice and Experience, Vol 7, No 6, 1977, pp 685-696.
6. N. Wirth, Acta Informatica, Vol 1, 1971, pp 35-63.
7. Xu Jiafu [1776 1367 4395] et al, DIANZI XUEBAO [ACTA ELECTRONICA SINICA], 1978, No 1, pp 49-56.
8. K. Jensen and N. Wirth, PASCAL-User Manual and Report, Lecture Notes in Computer Science, 18, Springer Verlag, 1974.
9. A. N. Habermann, ACTA INFORMATICA, Vol 3, 1973, pp 47-57.
10. O. Lecarme, M. C. Peyrolle-Thomas, Software--Practice and Experience, Vol 8, No 2, 1978, pp 149-170.
11. N. Wirth, The Programming Language PASCAL (Revised Report), Lecture Notes in Computer Science, 18, Springer Verlag, 1974.
12. Reider Conradi, Sigplan Notices, Vol 11, 1976, pp 8-25.
13. N. Wirth, IEEE Trans., Software Engineering, No 2, 1975, pp 192-198.
14. Chen Renfu [7115 0088 3940] et al, Operating Manual of the 655 Computer, Huadong Computer Technology Research Institute, 1974.

9296

CSO: 8111/0199

PROGRESS IN CANCER PREVENTION, CURE CALLED CONSIDERABLE

Beijing GUANGMING RIBAO in Chinese 23 Nov 80 p 1

[Text] Correspondent Li Wei [2621 5588] reports: At present more than half of the provinces, cities, and autonomous regions have established tumor hospitals, research institutes, and departments. In some key areas where there is a high incidence of tumors, prevention and treatment sites have been established. Many districts, cities, and counties with a high incidence of tumors have also established special hospitals or research institutes. A few commune public health centers in Heilongjiang, Hebei, Jiangsu, and Henan are also capable of relatively complex treatment of some tumors, including performing chest surgery, etc.

Scientific research into the prevention and treatment of cancer has made considerable progress in China in the past decade. The situation regarding deaths due to malignant tumors and the principle of distribution among the nation's 850 million people have been basically surveyed and clarified to produce a considerable quantity of scientific data.

With regard to studies on carcinogenesis, there have been a number of new discoveries. Epidemiological surveys and pathogenetic research have given some clues to the mortality condition and major pathogenesis of some key carcinomas in China. From these understandings, the possible relationship between esophageal cancer and some carcinogenic chemicals such as nitrosamines and molds and the possible relationship between rhinopharyngeal cancer and certain types of virus have been proposed. These discoveries have also found verification in animal experiments.

Based upon these clues of leading pathogenesis, cancer prevention activities, in combination with aspects of management, reform, three-waste treatment in industry and mines, and worker protection, have been launched among the masses. Through general surveys and early cancer treatment, the incidence of cervical cancer among female workers of the Shanghai textile system was reduced from the 170.6/100,000 of the 1950's to 32.6/100,000 in the 1970's. Due to early diagnosis and treatment of precancerous disorders, more than 90.6 of the patients survive more than 15 years.

Through a large amount of practice, methods of early diagnosis are being continuously improved, causing the rate of early diagnosis of such life-threatening tumors as esophageal cancer, liver cancer, and rhinopharyngeal cancer to be obviously higher. General surveys in high-incidence areas can cause cancers to be

discovered at a very early stage on patients who show no symptoms. The smallest discovered lung cancer and esophageal cancer are only the size of a rice grain; the smallest liver cancer is only the size of a soybean.

In the treatment of tumors, Chinese traditional drugs have been suitably adopted. After considerable selection among traditional medicinal herbs, six species, including *Cephalotaxus fortunei* Hook. f, are being organized for nationwide cooperative research. Some have been identified and can be synthesized or semi-synthesized to add to the number of anticancer drugs.

China's achievements in cancer prevention and treatment have attracted the attention of medical scientists of the world. The major problems in China's cancer treatment and research are: the results of advanced treatment and prevention methods and scientific research are not sufficiently extended; the total cure rate remains low and there remain a large number of persons who die of cancer; and there is a weakness in basic theoretical research. These problems should be earnestly resolved in the future.

6248

CSO: 4008

## FINE RESULTS ACHIEVED IN ABNORMAL HEMOGLOBIN RESEARCH

Beijing GUANGMING RIBAO in Chinese 26 Nov 80 p 2

[Text] Correspondents Wu Chongqi [0702 1504 0366] and Wan Zimei [8001 1311 5019] report: Delightful results have been obtained in abnormal hemoglobin research by China's medical researchers. At the most recently held Sino-American examination medicine discussion meeting, these results were regarded as very important by specialists of both nations.

As early as 1949, foreign medical specialists understood that abnormal hemoglobin is a form of anomaly of protein molecules and is a type of disease of the human blood. This type of hereditary disease is created by a qualitative or quantitative anomaly of the biosynthesis of hemoglobin in the human body or by the occurrence of mutation relating to the genes. There are many types of hemoglobin anomalies; at present, 350 types have been discovered worldwide. In China there had been no extensive research on the subject; therefore, understandings of the distribution, types, and clinical manifestations of hemoglobin anomalies in China, and especially of the molecular structure, were deficient. Sometimes, the manifestation of purple mucous membrane of hemoglobin M patients was mistaken for a sign of congenital heart disease; enlargement of the spleen and liver caused by Mediterranean anemia was mistakenly regarded as hepatitis or cirrhosis of the liver, etc.

China is a country with many nationalities. A clarification of the incidence and distribution of hemoglobin anomalies in the entire country is both theoretically important and practically significant for further analysis of the molecular structures to clarify the principle of heredity, for research into the process of ancestral migration, for genetic counseling and marital guidance, for clinical diagnosis, for contraindication of drug application, and for the search for ways to treat hemoglobin diseases.

The study of abnormal hemoglobin began in China in the 1960's. In the past several years, a joint effort by scientists of the Institute of Basic Medicine, Institute of Hematology Chinese Academy of Medical Sciences, the Shanghai Municipal Children's Hospital, the Guangxi College of Medicine, the Baotou College of Medicine, and regional medical researchers of Guangdong, Nei Menggu, Hunan, Jiangxi, and Sichuan has made it possible to carry out a survey of this disease. To date, more than 80,000 persons have been examined to reveal many persons of abnormal hemoglobin. These scientists have also carried out analyses of the molecular structure of about 10 types of abnormal hemoglobin of Chinese nationals, and these [analyses] have disclosed that hexachloro-dimethyl benzene causes



hemolysis in unstable abnormal hemoglobin. Based upon typing of hemoglobin anomalies, it is believed that toward the end of the Ming Dynasty, a large number of persons migrated from Guangdong to Sichuan. Through an analysis of the chemical structures of Chinese abnormal hemoglobins, it has been discovered that two types of hemoglobins are very important for studying the migration of our ancestors and the family histories of the various coastal islands of China. The hemoglobin P, discovered in Nei Menggu, has provided important material for further study of the theory, suggested by foreign scientists, that this type of hemoglobin in India was acquired from China. The discovery of Handsworth hemoglobin was the second such discovery in the world; the first discovery was in England in 1972. One case of abnormal hemoglobin with missing amino acid was discovered in Jiangxi. These chemical structural analyses are important for studying hemoglobin heredity. The discovery of hemoglobin E in South China and among the Mongolian nationality of Nei Menggu proves the extensive distribution of hemoglobin E. In Guangxi it was discovered that combining various genes may bring about seven types of Mediterranean anemia. The hereditary characteristics of abnormal hemoglobin E under the compound condition of Mediterranean hemoglobin were also learned. Of these types, an analysis of the more common B Mediterranean anemia provides a certain basis for the clinical diagnosis of abnormal hemoglobin and helps to analyze the symptoms of the two types of B and B+ in China.

6248

CSO: 4008

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### BRIEFS

BEIJING SCIENCE CONFERENCE--Beijing, 15 Jan (XINHUA)--A meeting, jointly sponsored by the Energy Committee of the Chinese Academy of Sciences and the Beijing Municipal Planning Committee to coordinate scientific research projects, emphatically discussed how to use Beijing's energy rationally and how to prevent environmental pollution. The experts and scientists attending the meeting pointed out that Beijing consumed 19.53 million tons of standard coal in 1979, but that the rate of energy use was low because of outdated equipment and technology. They maintained that study of energy conservation should be carried out through more advanced scientific and technological means with equipment currently available, and that all units should study exploration and utilization of new energy sources. They also maintained that it is imperative to carry out scientific study to reduce Beijing's air pollution caused mainly by the burning of coal. [OW200447 Beijing Xinhua Domestic Service in Chinese 0250 GMT 15 Jan 81]

CSO: 4008

# PUBLICATIONS

## TABLE OF CONTENTS OF 'LIUXINGBINGXUE ZAZHI' NO 3, 1980

Beijing LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 1  
No 3, Aug 80 inside back cover

[Text] Successful Immunization of Infants with Maternal  
Measles Antibodies by Partially Attenuated Measles Vaccine  
.....Huang Zhenxiang [7806 2182 4382], Deng Gang [6772 6921],  
Li Yuying [2621 3768 5391] and Wu Shuhua [0702 3219 5478],  
all of the Institute of Virology, Chinese Academy of Sciences;  
Jia Bingyi [6328 4426 5030], Hebei Institute of Epidemiology (131)

Studies on the Characteristics of the Occurrence of Post  
Vaccinal Measles and the Immune Status after Mass Inoculation  
with Live Measles Vaccine.....Anti-epidemic Station, Xiacheng  
District, Hangzhou; Contagious Diseases Research Group,  
Zhejiang College of Medical Science (136)

Competitive Complement Fixation Test for the Serodiagnosis of  
Patients with Epidemic Haemorrhagic Fever at the Acute Stage  
.....Zheng Yunkai [6774 0061 0418], Jiangxi Second People's  
Hospital; Xu Zhonghan [1776 1813 3352] and Zeng Xiaodong [2582  
2556 2639], both of Fengcheng County Anti-epidemic Station (14)

A Survey Report on the Abnormal Reactions of the Neurological  
System after Inoculation with Rabies Vaccine.....Anti-  
epidemic Station, Linyi County, Shandong Province (143)

The Characteristics of the Prevalence of Influenza Caused by  
a New A1 Virus in Guizhou in 1977.....Anti-epidemic Station,  
Guizhou, et al. (146)

Studies on the Serum Antibody Levels in Patients with Influenza  
Caused by H3N2 Virus at the Acute Stage.....Zhang Luxian [1728  
1712 0341], Ren Guifang [0117 6311 2455] and Zhu Jiming [2612  
2478 2494], all of the Institute of Virology, Chinese Academy  
of Sciences; Qi Yihua [2058 5669 5478] and Wang Guiqiu [3769  
2710 4428], both of the Institute of Biological Products,  
Ministry of Health (149)

- An Epidemiologic Investigation on the Role of Feces in Transmitting Hepatitis B.....Hu Zhaolie [5170 2507 3525] and Yuan Xianding [5913 6272 7844], both of Zibo Municipal Anti-Epidemic Station (152)
- A Clinical Analysis of 44 Children with Infectious Mononucleosis.....Wu Lizhen [0702 7787 6297], Zhang Peifeng [4545 1014 6912], Liu Zhongchang [0491 0022 1603] and Zhou Xinxiang [0719 2450 4382], all of Hengyang Medical College Affiliated Hospital (155)
- Explorative Studies on Endotoxin-like Substances in Leptospires.....Wu Suhuai [2976 4790 2037], Wang Huanqin [3769 3562 5367], Lu Minglan [7120 2494 5695] and Nie Dikai [5119 1717 2818], all of the Institute of Epidemiology and Microbiology, Chinese Academy of Medical Sciences (159)
- An Outbreak of Gastro-enteritis Transmitted from Man to Man Caused by *S. typhi-murium* Variant without Flagella.....Chen Jiachi [7115 1367 3589], Baotou Medical College; Gu Qingwu [6581 3237 0710], Biological Products Testing Laboratory, Ministry of Health; Gao Xiuhua [7559 4423 5478], Wuhai Municipal Public Health and Anti-epidemic Station (162)
- Evaluation of "O" Indirect Haemagglutination Test for the Diagnosis of Typhoid Fever.....Pu Changguo [2613 2490 0948], Li Mei [2621 2734] and Song Li [1345 0500], all of Jilin Provincial Public Health and Anti-epidemic Station (167)
- Comparison of Immunofluorescent Antibody Technique and Cultural Method for the Diagnosis of Bacillary Dysentery.....Ye Yousong [5509 0645 2646], Hubei Provincial Public Health and Anti-epidemic Station; Zhu Xianzhong [2612 0752 1813], Wang Fengxuan [3769 7685 6513] and Liu Chunfang [0491 2504 5364], all of Xiangyang Regional Public Health and Anti-epidemic Station (170)
- Trials of Immunization of Mice and Guinea Pigs with the Immunogens Extracted from Brucella.....Shang Deqiu [1424 1795 4428] and Li Lanyu [2621 5695 3768], both of the Institute of Epidemiology and Microbiology, Chinese Academy of Medical Sciences (173)
- Application of "Unithiol" Test for the Serodiagnosis of Brucellosis.....Wang Quanhe [3769 3123 3109], Shihezi Municipal Public Health and Anti-epidemic Station, Xinjiang (177)
- Preliminary Studies of ILESA for Detection of Brucella.....Guo Zhanggai [6753 4545 3346] and Wei Tao [7614 3447], both of the Institute of Epidemiology and Microbiology, Chinese Academy of Medical Sciences; Li Yuankai [2621 0337 0418], Institute of Epidemiology, Xinjiang Autonomous Region (179)

Studies on Preparing Limulus Amoebocyte Lysate.....Wang Jinghong [3769 2529 1347] and Cheng Yaozhang [4453 1031 4545], both of the Institute of Epidemiology and Microbiology, Chinese Academy of Medical Sciences; Fei Kefen [6316 0344 5358], Cui Dequan [1508 1795 3123] and Fan Ruilan [5400 3843 5695], et al., all of the Biological Products Institute, Ministry of Health; Shu Guangya [5289 0342 0068], Local Disease Prevention Station No 1, Jilin Province; Liu Lusheng [0491 7120 0581], Zhanjiang Regional Public Health and Anti-epidemic Station (182)

The Antidotal Effects of Nicotinamide to Rodenticidal Agents RH-787 and RH-945.....Wang Chengxin [3076 6134 0207], Liu Dangnu [0491 8093 1166] and Tian Yanlin [3944 1750 2651], all of the Institute of Epidemiology and Microbiology, Chinese Academy of Medical Sciences; Zhang Wansheng [1728 8001 3932], Nei Monggol Epidemic Prevention and Treatment Institute (186)

Preliminary Studies on the Effects of Bacillus thuringiensis var israelensis for Killing the Larvae of Mosquitos.....Zhou Dasheng [0719 6671 3932], Zhao Jiwen [6392 1323 2429], Li Mingda [7812 2494 6671] and Xu Cuiyu [1776 5488 3842], all of the Epidemiology Teaching and Research Group, Nanjing Railroad Medical College (190)

Characterization of Strains of 30 Bacterial Strains Isolated from Rat Fleas Capably of Being Lysed by the Pseudotuberculosis Bacteriophages.....Joing Investigation Team of Five Southern Provinces (194)

The Basic Theory of Epidemiology and Its Application (continued).....Xu Zhiyi [1776 1807 0001], Epidemiology Teaching and Research Group, Shanghai First Medical College (195)

Limulus Amoebocyte Lysate (LAL) Gelation Test.....Jiang Shunqiu [1203 7311 3061] and Wang Qingxi [3769 1987 4406], both of the Institute of Epidemiology and Microbiology, Chinese Academy of Medical Sciences (198)

9717  
CSO: 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'YUANZIHE WULI' NO 3, 1980

Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 2 No 3, 1980 inside back cover

[Text] Multiple Scattering Formalism and Method of Green's Functions.....Wu Shishu [0702 1709 2873] and Yao Yujie [1202 3768 3381], both of the Department of Physics, Jilin University, Changchun (193)

Nuclear Polarization of  $^{15}\text{N}$  Via Ion-Beam-Foil Interaction..... B. I. Douch, Institute of Physics, University of Aarhus, DK-8000 Aarhus C, Denmark; Liu Chongheng [0491 1504 1854], Department of Physics, University of Queensland, Australia; Lu Fuquan [7120 4395 0356], Sun Changnian [1327 2490 1628] and Tang Jiayong [3282 1367 6978], et al., all of the Department of Nuclear Science, Fudan University, Shanghai, China (205)

Excitation Curve Measurement for the Reaction  $^{89}\text{Y}(n, 2n)^{88}\text{Y}$  .....Huang Jianzhou [7806 1696 0719], Lu Hanlin [4151 3211 2651], Li Jizhou [2621 7139 0719] and Fan Peiguo [5400 1014 0948], all of the Institute of Atomic Energy, Chinese Academy of Sciences, P.O. Box 275, Beijing (213)

Quasi-free Scattering in  $^6, ^7\text{Li}(\alpha, 2\alpha)^2, ^3\text{H}$  Reactions at Low Energy.....Zhang Peihua [1728 1014 5478], Sun Zuxun [1327 4371 6064] and Wen Keling [2429 0344 3781], et al., all of the Institute of Atomic Energy, Chinese Academy of Sciences, P.O. Box 275, Beijing (219)

A  $\gamma$ -Ray Spectrometer System for Measurement of Secondary  $\gamma$ -Ray Spectra Produced in Fast Neutron Reaction.....Huang Zhengde [7806 2973 1795], Cao Zhong [2580 1813] and Li Zhankui [2621 0594 7608], et al., all of the Institute of Atomic Energy, Chinese Academy of Sciences, P.O. Box 275, Beijing (229)

$^7\text{Li}(d, n)$  Neutron Spectra and the  $^7\text{Li}(d, 2\alpha)n$  Reaction Induced by 13.2 MeV Deuterons.....Ma Weiyl [7456 4850 5030], Wang Dao [3769 3058], Yan Chen [7027 6591] and Sun Hancheng [1327 3352 1004], all of the Institute of Atomic Energy, Chinese Academy of Sciences, P.O. Box 275, Beijing (239)



The  $Z^{-1/3}$ -Law for the Nuclear Giant Resonance Energy.....  
 Zeng Jinyan [2582 6210 6056], Department of Physics, Beijing  
 University, Beijing; Yang Fujia [2799 4395 1367], Department  
 of Physics, Fudan University, Shanghai (245)

Backbending Mechanism of  $^{155,156}\text{Er}$ .....Zhang Xizhen [1728  
 6932 1791], He Hanxin [0149 3352 2450] and Chen Yongshou  
 [7115 3057 1108], all of the Institute of Atomic Energy,  
 Chinese Academy of Sciences, P.O. Box 275, Beijing; Gao Yuanyi  
 [7559 0337 5030], Institute of Modern Physics, Chinese Academy  
 of Sciences, P.O. Box 31, Lanzhou (253)

Bromian Motion and Fission Rate.....Wu Xizhen [0702 6932  
 4176] and Zhuo Yizhong [0587 4135 1813], both of the Institute  
 of Atomic Energy, Chinese Academy of Sciences, P.O. Box 275,  
 Beijing (257)

Quark Force and Nuclear Force. 1. n-p Scattering.....  
 Wang Fan [3769 0416], Nanjing University, Nanjing; He Yin  
 [0735 7299], Institute of Atomic Energy, Chinese Academy of  
 Sciences, Beijing (261)

Theory of Transfer Matrices for Intense Ion Beam.....Yu  
 Qingchang [6735 1987 7022], Institute of High Energy Physics,  
 Chinese Academy of Sciences, P.O. Box 918, Beijing (271)

Field Experience of  $\text{Ge(Li)}-(n, n'\gamma)$  Gamma Ray Spectral  
 Logging for Verifying Principle.....Institute of Atomic  
 Energy and Daqing Research and Planning Institute Joint Re-  
 search Group (277)

#### Research Notes

Measurement of Cross Section for the Reaction  $^{55}\text{Mn}(n, 2n)^{54}\text{Mn}$   
 .....Lu Hanlin [4151 3211 2651], Li Jizhou [2621 7139 0719],  
 Fan Peiguo [5400 1014 0948] and Huang Jianzhou [7806 1696  
 0719], all of the Institute of Atomic Energy, Chinese Academy  
 of Sciences, P.O. Box 275, Beijing (286)

9717  
 CS0: 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'WUTAN YU HUATAN' NOS 2 AND 3, 1980

Beijing WUTAN YU HUATAN [GEOPHYSICAL AND GEOCHEMICAL EXPLORATION] in Chinese  
Nos 2 and 3, 1980

[No 2, 1980 on back cover]

[Text] Discussion of the Precision of Two-Dimensional Continuation Methods for the Interpretation of Magnetic Anomalies  
.....Liu Shiyi [0491 1102 3015] and Gao Weiyu [7559 1983 0056] (1)

Gradient Measurement in Magnetic Prospecting.....Qin Baohu  
[4440 5508 3840] (12)

Spectrographic Methods for Determination of Trace Amount of Gold in Geochemical Samples.....Laboratory of the Henan Geological Bureau (19)

Numerical Interpretation of Resistivity Soundings.....Chen Zhonghou [7115 0112 0230] and He Changli [0149 2490 4409] (27)

A Technique for Discriminating the Conducting Magnetic Bodies by the Transient EM Method with an Example.....Jiang Bangyuan [5592 6721 6678] (32)

Application of Magnetic Susceptibility Logging in Reconnaissance Prospecting for Magnetite in the Huaibei Area.....  
Liu Tiancheng [0491 1131 2052] (35)

Characteristics and Criteria for the Primary Anomalies of a Copper Deposit in Heilongjiang Province.....Xu Waisheng [1776 1120 3932] and Zhu Bingqiu [2612 3521 3808] (41)

[No 3, 1980 on back cover]

[Text] Some Suggestions for the Promotion of Regional Geophysical Reconnaissance.....Jiang Mei [1203 2653], Mineral Geology Institute, Ministry of Geology (1)

- Halogen Determination in Mining Districts.....Wang Zhenguang  
[3769 4176 0342] and Fu Zhongqi [4569 0022 0366] (10)
- Gradient Measurements in Magnetic Exploration.....Qin Baohu  
[4440 5508 3840], Geophysical Exploration Brigade, Hunan  
Bureau of Geology (17)
- Variable Density Corrections of Gravity Data.....Wang Gong-  
nian [3769 0361 1819], Geophysical Exploration Team, Guangdong  
Bureau of Geology (23)
- Variable Density Corrections for Topographic Intermediate  
Layers.....Li Pengnian [2621 1756 1628] and Pan Minkong  
[3382 3046 4500], both of the Geophysical Exploration Team,  
Xinjiang Petroleum Headquarters (27)
- A Technique for Multi-element Identification of Standard  
Geological Samples--Non-destructive Neutron Activation Analysis  
.....Sun Jingxin [1327 2529 0207], Chen Bingru [7115 0393 1172]  
and Wang Yuqi [3769 3768 3823], et al., all of the Institute of  
High Energy Physics, Chinese Academy of Sciences (39)
- Trial Analysis of Geological Samples by Instrumental Neutron  
Activation.....Chen Baoguan [7115 0202 6034], Ma Mingqiang  
[7456 3046 1730] and Gong Huili [7895 1920 5461], et al.,  
all of the Geophysical Exploration Institute, Ministry of Geology (32)
- Observations on Application of Natural Gamma Logging in Coal-  
Field Exploration.....Ye Qingsheng [5509 1987 3932], Bureau  
of Geology, Ministry of Coal Industry; Li Chongru [2621 1504  
0320], Geological Exploration Headquarters, Ministry of Coal  
Industry (39)
- Comments on the Primary Anomalies and Their Formation over a  
Copper-Molybdenum Deposit in Jiangxi Province.....Xu Waisheng  
[1776 1120 3932] and Zhu Bingqiu [2612 3521 3808], both of the  
Geophysical Exploration Institute, Ministry of Geology (46)
- Results of Induced Polarization Sounding over a Sedimentary  
Metamorphic Iron Deposit.....Li Jinming [2621 6855 6900] (54)
- Some Remarks on Elevation Corrections in Gravity Survey.....  
Liu Yangyuan [0491 7402 3293] (58)

9717  
CS01 4008

# PUBLICATIONS

## TABLE OF CONTENTS OF 'SHENJING-JINGSHEN JIBING ZAZHI' NO 3, 1980

Guangzhou SHENJING-JINGSHEN JIBING ZAZHI [JOURNAL OF NERVOUS AND MENTAL DISEASES]  
in Chinese No 3, Jun 80 inside back cover

### [Text] Contents in Brief

- Studies on Acupuncture Anesthesia in Neurosurgery.....Chen Gongbai [7115 0361 4101], Huashan Hospital, Shanghai First Medical College; Ding Yuji [0002 5148 1015], Beijing Xuanwu Hospital; Li Qingbin [2621 1987 1755], Tianjin Medical College Affiliated Hospital; Gao Yuhua [7559 3768 5478], Anhui People's Hospital; Ying Shida [2019 6108 6671], Shandong Medical College Affiliated Hospital; Chen Huahui [7115 5478 6540], Nanjing Medical College Workers' Hospital; Luo Qizhong [5012 0366 0022], Shanghai Second Medical College Third Affiliated Hospital; Ma Lie [7456 3525], Zhejiang College of Medical Sciences Second Affiliated Hospital (129)
- Investigation on the Role of Caudate Nucleus in Acupuncture Analgesia.....Jiang Dengchuan [3068 3397 1557], Li Shengchang [2621 4141 2490] and Chen Gongbai [7115 0361 4101], all of the Neurology Laboratory, Huashan Hospital, Shanghai First Medical College; Yang Baiyi [2799 2672 0308] and Jiang Deming [1203 1795 2494], both of the Physiology Group, Department of Biology, Fudan University; Yan Jie [7346 2638] and He Lianfang [0149 5571 5364], both of the Acupuncture Anesthesiology Research Group, Fundamentals Section, Shanghai First Medical College (135)
- Medial Meningeal Artery-Middle Cerebral Artery Anastomosis (A Case Report).....Zhang Lifu [1728 4539 4395], Zhou Jiaquan [0719 1367 0356] and Ren Shaoxing [0117 4801 5281], all of the Neurosurgery Department, Sichuan People's Hospital (141)
- Surgical Treatment of Cervical Spondylotic Myelopathy (An Analysis of 31 Cases).....Duan Guosheng [3008 0948 0581], Liu Bingcun [0491 3521 1317] and Zhang Ji [1728 4764], all of the Brain Surgery Department, PLA General Hospital (143)

- Lumbosacral Spina Bifida Occulta with Upper Segmental Sensory Disturbances (A Report of Five Cases).....Jia Zuoting [6328 0146 1694], Wang Yi [3769 3015] and Jiang Xianming [5592 0341 2494], all of the Neurosurgery Department, First Affiliated Hospital, Fourth Military Medical College; Su Xiuchu [4725 4423 0443], Neuromedical Department, First Affiliated Hospital, Fourth Military Medical College (146)
- The Evaluation of Brain Scintiphotograph in Diagnosis of Intracranial Space-Occupying Lesions (An Analysis of 65 Cases)..... Wang Guangxian [3769 0342 0341], Isotopes Section, Guiyang Medical College Affiliated Hospital; Lu Liang [4151 0081], Neurology Section, Guiyang Medical College Affiliated Hospital (148)
- Intracranial Epidermoid and Dermoid Cyst (An Analysis of 117 Cases).....Ding Yuji [0002 5148 1015], Beijing Xuanwu Hospital (151)
- Ultrasound Measurements of Ventricular Waves (An Analysis of 114 Cases).....Xu Qigang [1776 0796 0474], Cerebrospinal Department, Gansu People's Hospital (154)
- Primary Orthostatic Hypotension (A Report of Seven Cases)..... Shen Dinglie [3088 7844 3525], Neurology Section, Chongqing Medical College, First Hospital; Xie Shuping [6200 3219 1627] and Wei Gangzhi [7614 1511 0037], both of the Neurosurgery Department, Xuanwu Hospital, Beijing Second Medical College; Wu Baoren [0702 0202 0088] and Su Xiuchu [4725 4423 0443], both of the Neurology and Psychiatry Teaching and Research Group, First Affiliated Hospital, Fourth Military Medical College; Yin Zongxin [1438 1350 0207], Ma Denghong [7456 4098 1347] and Zhu Deming [2612 1795 2494], all of the Neurology Department, Bengbu Medical College Affiliated Hospital (156)
- Follow-up Study of Relapses in 211 Schizophrenics..... Zhang Guangqi [1728 1639 1477], Su County Regional Psychiatric Hospital, Anhui (161)
- Clinical Analysis of 39 Cases of Puerperal Psychosis..... Zhu Changming [2612 2490 2494], Mental Illness Research Group, Sichuan Medical College (163)
- Psychotic Manifestations Associated with Pellagra (A Report of Five Cases).....Peng Changxiao [1756 2490 1321] and Zhai Shutao [5049 2579 3447], both of Nanjing Neuropsychiatric Hospital (165)

9717  
CSO: 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'SHENJING-JINGSHEN JIBING ZAZHI' NO 4, 1980

Guangzhou SHENJING-JINGSHEN JIBING ZAZHI [JOURNAL OF NERVOUS AND MENTAL DISEASES]  
in Chinese No 4, Aug 80 inside back cover

#### [Text] Contents in Brief

- Clinical Analysis of 187 Cases and Pathologic Observations of 7 Cases.....Wang Wuji [3076 3541 4787] and Wang Lupei [3769 4389 1014], both of the Neurology Teaching and Research Group, Xinjiang Medical College; Zhao Yulin [6392 5940 3829], Microbiology Teaching and Research Group, Xinjiang Medical College (193)
- Preliminary Observations of Nailfold Microcirculation of Apoplectic Patients (A Report of 100 Cases).....Hou Huiguang [0186 6540 0342], Department of Neurology, Changzheng Affiliated Hospital, Second Military Medical College (198)
- Clinicopathologic Analysis of 55 Cases of Hypertensive Arteriosclerotic Cerebral Hemorrhage.....Qin Zhiyu [4440 5347 0046] and Zhang Fulin [1728 4395 2651], both of Huashan Hospital, Shanghai First Medical College; Fang Jun [2455 6511], Pathology and Dissection Teaching and Research Group, Shanghai First Medical College (200)
- Rheoencephalography of 40 Cases of Ischemic Cerebrovascular Disease.....Zhao Mingxiang [6392 2494 4382], Huang Shuming [7806 7311 2494] and Lu Liang [4151 0081], all of the Neurology Department, Guiyang Medical College Affiliated Hospital (204)
- Expressive Aphasia and Skillful Digital Maneuver (An Analysis of One Case).....Qin Zhen [4440 7201] and Zhang Yuanchang [1728 3293 2490; deceased], both of the Neurology Department, Huashan Hospital, Shanghai First Medical College (206)
- Cerebellar Hemorrhage of Vascular Malformation (A Report of Six Cases).....Kang Dexuan [1660 1795 8830], Department of Neurology, Beijing Medical College Third Affiliated Hospital; Zheng Jie [6774 2638], Pathology and Dissection Teaching and Research Group, Beijing Medical College Third Affiliated Hospital (210)



Five Year Follow-up Study of 107 Cases of Cerebrovascular Disease.....Zhao Mingxiang [6392 2494 4382] and Zeng Guoheng [2582 0948 3801], both of the Neurology Department, Guiyang Medical College Affiliated Hospital (214)

Preliminary Report on Schizophrenic Twins.....Fang Huitai [2455 1920 3141], Jiang Sanduo [3068 0005 1122], Li Changfu [2621 7022 1381] and Lin Zhiguang [2651 3112 0342], all of the Genetics Group, Laboratory of the Shanghai Municipal Hospital for the Prevention and Treatment of Mental Illness (216)

Investigation of Adenosine Deaminase in Schizophrenic Patients .....Huang Mingsheng [7806 2494 3932], Mental Illness Research Group, Sichuan Medical College; Dong Yunhua [2639 0061 5478], Workers' Health Teaching and Research Group, Department of Health, Sichuan Medical College; Ju Yunlong [1446 0061 7893] and Guo Quanyong [6753 3123 3196], both of Suzhou Psychiatric Hospital (221)

Clinical Analysis of 59 Cases of Reactive Psychosis..... Gao Zhisheng [7559 5267 0524], Hunan Psychiatric Hospital (223)

Diagnosis and Surgical Treatment of Acoustic Neurinoma (A Report of 110 Cases).....Chen Mingzhen [7115 2494 2182], Cai Jiyan [5591 4764 6562] and Zheng Shuiguo [6774 3055 6665], all of the Department of Neurosurgery, Zhongshan Medical College First Affiliated Hospital (225)

Clinical Analysis of 151 Cases of Acute Subdural Hematoma..... Tian Gengshu [3944 1649 2050] and Xue Qingcheng [5641 1987 3397], both of the Cerebrospinal Department, Tianjin Medical College Affiliated Hospital (229)

Non-Tumoral Occlusion of the Aqueduct of Sylvius (A Report of 10 Cases).....Jiang Jieliang [1203 4634 5328] and Wang Weijun [3769 4850 6874], both of the Department of Neurosurgery, Capital Hospital, Chinese Academy of Medical Sciences (232)

9717  
CS01 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'BANDAOTI XUEBAO' NO 4, 1980

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4,  
Nov 80 on back cover

- [Text] Calculations of the Energy Bands of the Quaternary Alloy  $\text{In}_{1-x}\text{Ga}_x\text{As}_y\text{P}_{1-y}$  by the Pseudopotential Method.....  
Lu Fen [7120 1164] and Zhang Kaiming [1728 7030 2494], both of the Modern Physics Institute, Fudan University (266)
- Long-Wavelength Optical Phonon Spectra of Mixed Crystals .....Wu Ji'an [0702 3078 1344], Institute of Semiconductors, Chinese Academy of Sciences (273)
- Electron Microscopy Study of Microdefects of Heavily Tellurium-Doped Gallium Arsenide.....Fan Tiwen [5400 4895 2429], He Hongjia [0149 1347 1367], Bai Yuke [4101 3768 3784] and Fei Xueying [6316 7185 5391], all of the Institute of Semiconductors, Chinese Academy of Sciences (279)
- Influence of Boron Diffusion on the Oxidation-Induced Stacking Faults in Silicon.....Bao Ximao [7637 1585 5399], Ji Fuquan [1518 4395 2938] and Huang Xinfan [7806 0207 0416], all of the Department of Physics, Nanjing University (285)
- Assessment of Epitaxial Silicon Film on Sapphire (or Spinel) by Reflection Spectrum.....Zhang Zehua [1728 3419 5478], Research Group for Optical Properties of Semiconductors, Institute of Semiconductors, Chinese Academy of Sciences (291)
- Varied Cross Section FET (VCFET).....Zhu Enjun [2612 1869 0971], Electron Tube Factory, Beijing (297)
- Study of the Process of Producing Stable Hot Spots in Bipolar Power Transistors.....Gao Guangbo [7559 0342 3258], Department of Radio-Electronics, Beijing Polytechnic University (303)
- Replacement of Configurations in CAD Mask Making of LSI.....Zhuang Wenjun [5445 2429 0689], Li Quansheng [2621 0356 5110] and Shen Yongzhou [3088 3057 0719], all of the Institute of

Semiconductors, Chinese Academy of Sciences (310)

Laser Annealing of Zn-Implanted GaAs and Laser Alloying of Ohmic Contacts on GaAs.....Gong Jishu [1712 4949 2579], Zheng Baozhen [6774 1405 4176], Zhuang Weihua [5445 5588 5478] and Xu Zhongying [1776 0112 5391], all of the Institute of Semiconductors, Chinese Academy of Sciences (317)

#### Research Notes

Polar Electric Potential Properties of the Slow Excitons in Polar Crystals.....Gu Shiwei [7357 0013 3161], Nei Monggol University (318)

A Study of the Residual Impurities in LPE-GaAs.....Lin Lanying [2651 5695 5391], Fang Zhaoqiang [2455 0340 1730] and Zhou Bojun [0719 0130 7486], et al., all of the Institute of Semiconductors, Chinese Academy of Sciences (321)

Integrated Schottky Logic (ISL).....Yang Dayan [2799 1129 3508] and Xu Ping [6079 1627], both of the Shaanxi Microelectronics Research Institute (324)

A BCCD Model of One Dimension and Its Numerical Analysis.....Cui Chenglie [1508 2052 3525], Institute of Semiconductors, Chinese Academy of Sciences (328)

Research on the Pattern Generation Method for Testing LSI Circuits.....Lin Yu [2651 7183], Institute of Semiconductors, Chinese Academy of Sciences (332)

Photoetching Characteristics without Development for Various Photoresists.....Han Jieping [7281 7132 1627], Cooperative Research Group of Photoetching without Development, Institute of Semiconductors, Chinese Academy of Sciences (334)

A Lithographic Technique of Scanning Electron Beam without Development.....Sun Yuping [1327 3022 1627], Han Jieping [7281 7132 1627] and Liang Junhou [2733 0193 0624], et al., all of the Institute of Semiconductors, Chinese Academy of Sciences (336)

9717

CSO: 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'GAONENG WULI YU HE WULI' NO 6, 1980

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]  
in Chinese Vol 4 No 6, 1980 inside back cover

- [Text] Performance of the Large Area Plastic Scintillation Counter.....Chen Yingxuan [7115 2503 1357], Jiang Yinlin [1203 0603 3829] and Ren Guoxiao [0117 0948 1321], et al., all of the Institute of High Energy Physics, Chinese Academy of Sciences (688)
- A Six Input Programmable Trigger Logical Circuit.....Ding Huiliang [0002 1979 5328], Yang Xirong [2799 3356 2837], Yu Zhongqiang [6735 1813 1730] and Gu Songhua [7357 2646 5478], all of the Institute of High Energy Physics, Chinese Academy of Sciences (693)
- Assessment of the Radiological Impact of the 50 GeV BPS (Beijing Proton Synchrotron) on Its Environment.....K. Goebel, CERN, Geneva, Switzerland; Ye Sizong [5509 0843 1350], Zhu Yucheng [2612 5148 6134] and Liu Guilin [0491 2710 2651], et al., all of the Institute of High Energy Physics, Chinese Academy of Sciences (705)
- The Parameters and Electrical Tolerance Analysis for the Single Buncher Systems.....Wei Kaiyu [7614 7030 3558], Institute of High Energy Physics, Chinese Academy of Sciences (714)
- Multiple Scattering Theory and High Energy p-p Elastic Scattering.....Li Yangguo [2621 2254 0948] and Zhang Yushun [1728 4416 7311], both of the Institute of High Energy Physics, Chinese Academy of Sciences; Chen Xiaotian [7115 2556 1131] and Ruan Tunan [7086 0956 0589], both of the University of Science and Technology of China (723)
- The Time-Dependencies of the Static Solution of SU(2) and SU(3) Gauge Theory in the Presence of Static Extended Source .....Dong Fangxiao [2639 2455 2556], Zhou Xianjian [0719 0752 1696], Huang Tao [7806 3447] and Xue Piyou [5641 0012 0645], all of the Institute of High Energy Physics, Chinese Academy of Sciences (734)

- Monte-Carlo Simulation of Cosmic Ray Antiproton Intensity  
.....Ding Linkai [0002 2651 1052] and Zhu Qingqi [2612 3237  
2579], both of the Institute of High Energy Physics, Chinese  
Academy of Sciences (740)
- The Possible Effect of Pairing on Yrast Traps.....Zhang  
Xizhen [1728 6932 3791], Institute of Atomic Energy, Chinese  
Academy of Sciences (743)
- A Correlative Treatment of Dynamics and Diffusion Equations  
in Deep Inelastic Collisions.....Zhong Jiquan [6945 4764  
3123], Institute of Modern Physics, Chinese Academy of Sciences (751)
- Velocity Current Distribution for Fast Rotation Nuclei.....  
Wu Xizhen [0702 6932 4176], Zhang Xizhen [1728 6932 3791],  
Zhuo Yizhong [0587 4135 1813] and Feng Renfa [7458 0088 4099],  
all of the Institute of Atomic Energy, Chinese Academy of  
Sciences (760)
- Research Notes
- The Large Momentum Behavior of the Pion Wave Function and the  
Pion Electromagnetic Form Factor.....Huang Chaoshang [7806  
2600 0794], Institute of Theoretical Physics, Chinese Academy  
of Sciences (766)
- The Isobar Excitation Mechanism of the Pion Single Charge  
Exchange Reaction.....Liu Bo [0491 3134] and Zhang Zongye  
[1728 1350 8763], both of the Institute of High Energy Physics,  
Chinese Academy of Sciences (770)
- Selection of the Measuring Time in the Absolute Counting of  
Radioactivity.....Feng Xizhang [7458 6932 3864] and Zhao  
Zhenlan [6392 3791 5695], both of the Institute of High Energy  
Physics, Chinese Academy of Sciences; Tang Naixun [3282 0035  
0534], General Research Institute for Non-Ferrous Metals, the  
Ministry of Metallurgical Industry (773)
- Planar Multipole Field of a Permanent Magnet System with  
Multi-segmented Ring Structure.....Liu Maosan [0491 5399  
0005], Chen Renhuai [7115 0088 2037], Wu Wentai [0702 2429  
3141] and Li Shuzhen [2621 3219 3791], all of the Institute  
of High Energy Physics, Chinese Academy of Sciences (777)
- The Adiabatic-Born Approximation of the Optical Model for  
Deformed Nuclei.....Yang Zesen [2799 3419 2773], Beijing  
University (783)

On the Mechanism of Backbending in Nuclei  $^{162,164}\text{Er}$ ,  
 $^{164,166}\text{Yb}$  and  $^{168}\text{Hf}$ .....Zhang Jingye [1728 2417 2814],  
Institute of Modern Physics, Chinese Academy of Sciences;  
Zhang Xizhen [1728 6932 3791], Institute of Atomic Energy  
Chinese Academy of Sciences

(787)

A Simple Model for Studying the Stretch at Scission Point  
in Fusion-Fission and Quasi-fission Induced by Heavy Ions  
.....Wang Zhengda [3769 2973 1129], Xu Shuwei [1776 2885  
1218] and Miao Rongzhi [4924 1369 0037], all of the Institute  
of Modern Physics, Chinese Academy of Sciences

(794)

9717

CS01 4008



## PUBLICATIONS

### TABLE OF CONTENTS OF 'JIANZHU XUEBAO' NO 5, 1980

Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 5, 1980 p 64

[Text] In Defense of the Falsely Accused Article "Creating New Styles of Chinese Socialist Architecture" by Liu Xiufeng .....Chen Zhi [7115 2784]	(1)
Opinions on City Planning of Beijing.....Teaching and Research Group on City Planning, Department of Architecture, Qinghua University	(6)
Architectural Forum	
Advantages and Disadvantages of High-Rise Apartments in China .....Qin Guan'gan [2953 7070 3227]	(16)
Comments on the Design of the Second Clinic Building of the People's Hospital, Suzhou.....Jiang Yaojun [5592 5069 7486], Suzhou Architectural Design Group	(18)
Opinions on the Article "A Few Problems on Theater Design" .....Liu Wenbo [0491 2429 3134]	(22)
Nationalistic Style vs Nationalistic Form.....Cao Qinghan [2580 1987 3211]	(24)
Landscape Gardening Tradition Serving the Present.....	(26)
Design and Research--Public Buildings	
On Designing General Hospitals at the County Level..... Luo Yunhu [5012 6663 3275], Chongqing College of Architectural Engineering	(28)
Lijiang Theater, Guilin.....Gao Lei [7559 7191]	(33)
Auditorium of Dongfeng Hotel, Chengdu.....Feng Shuqing [7458 3219 0615] and Zhao Peisen [6392 1014 2773], et al.	(37)

Rehearsal Theater for Puppet Show Troupe of Shanxi..... Wang Zhiyuan [3769 1807 6678] and Wu Naizhen [0702 1698 3791]	(40)
Provincial Gymnasium of Shandong.....Institute of Architectural Design, Shandong	(42)
Gymnasium at Baixia Road, Chengdu.....Li Tuofen [7812 0150 5358], Zhan Kunfan [2069 0981 5400] and Huang Guoying [7806 0948 5391], Southwest Academy of Architectural Design	(47)
Great Wall Hotel, Beijing.....	(48)
Jinling Hotel, Nanjing.....	(51)
District Planning and Housing Design	
Apartment Unit Type Study.....Gu Baohe [7357 1405 0735]	(54)
Three-storied Urban Dwellings Preferred.....Xue Zhongling [5641 6945 7227]	(56)
Architecture Abroad	
Kisho Kurokawa--Works and Views.....Qiu Xiwen [6726 4423 2429]	(58)
Academic Activities.....	(25)
Front Cover: by Chen Shimin [7115 0013 3046]	

9717

CSO: 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'WUTAN YU HUATAN' NO 5, 1980

Beijing WUTAN YU HUATAN [GEOPHYSICAL AND GEOCHEMICAL EXPLORATION] in Chinese  
No 5, 1980 on back cover

- [Text] Processing and Evaluation of Regional Geochemical  
Survey Data in Anhui-Zhejiang-Jiangxi Border Area.....  
Xie Xuejin [6200 1331 6930] and Li Yuqing [2621 3768 3237],  
both of the Institute of Geophysical Exploration; Fang Zheng-  
kang [2455 2973 1660], Zhejiang Geophysical Exploration Team;  
Mei Zhankui [2734 0594 7608], Jiangxi Geophysical Exploration  
Team; Zhao Shengke [6392 0581 0668], Anhui 332 Geology Team (1)
- An Overview and Prospects of Coal-field Well-logging Tech-  
niques in China.....Ye Qingsheng [5509 1987 3932], Bureau  
of Geology, Ministry of Coal Industry (13)
- A Method for Terrain Corrections in Gravity Survey with  
Irregular Grids.....Liu Wenjin [0491 2429 6930], Institute  
of Geophysical Exploration, Ministry of Geology; Liu Liyan  
[0491 4539 6056], Geophysical Exploration Brigade, Xinjiang  
Bureau of Geology (19)
- A Vertical Magnetic-dipole Electromagnetic Sounding Technique  
in the Frequency Domain.....Liu Zhenduo [0491 2182 6995] and  
Shi Weixiong [4258 4850 3574] (22)
- Principles of Ground EM Wave Method and Some Initial Experi-  
mental Results.....Kou Shengwu [1379 4939 2976] and Kong  
Xiangbin [1313 4382 0319] (33)
- A Direct Approach to Interpretation of Vertical Magnetic  
Anomalies over Rugged Topography.....Guo Shaoyong [6753 4801  
7167], Chengdu College of Geology (41)

9717  
CSO: 4008

## PUBLICATIONS

### TABLE OF CONTENTS OF 'DIANLI JISHU' NO 10, 1980

Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 10, 5 Oct 80 inside back cover

- [Text] Improvements of 125MW Generating Unit: Present Status and Prospects.....Guo Yuchao [6753 6276 6389], Minhang Power Plant (1)
- Burning Low Grade Coal in Boilers: Experience and Measures .....Zhang Feiruo [1728 2431 5387], Linzhou Power Plant (7)
- Series Resonance Withstand Voltage Test of Large Generator .....Yao Huannian [6008 3562 1628], Henan Electrical Power Research Laboratory (10)
- Noise Control in Central Control Room of Thermal Power Plant .....Wang Fengzhen [3769 7685 3791] and Cao Xiaozhen [2580 1321 2182] (15)
- Hydraulic Central Control of Circulating Water Valves..... Zhao Yizhong [6392 0001 0022] and Xu Ruiling [6078 3843 3781], both of Weihuliang Power Plant (20)
- Phase-Analysis of 20Cr1Mo1VNBt1B Steel.....Cheng Nanru [453 2809 5423], Xi'an Heat Engineering Institute, Ministry of Electric Power Industry (23)
- Investigation of Steel Structure Application in the Main Building of Thermal Power Plants.....Miao Lijun [5379 4539 6874] (28)
- Antipollution Problems of External Insulation for Transmission Systems.....Wang Zun [3769 6690], Institute of Electric Power Science; Xu Tongxun [1776 6639 6064], Bureau of Technological Improvements, Northeast Power Management Bureau (30)
- Error Analysis of Transmission System Ground Capacitance Measurement by Insertion of External Capacitance.....Liu Bingyao [0491 3521 1031], Hunan University (39)

Guy-Wire Erection of Transmission Line Poles and Towers.....  
 Lin Jimin [2651 3444 3046], Jilin Power Industry Bureau (43)

#### Innovation

Repair of Refractory Lining in Cyclone Furnace.....Xu Yangqun  
 [1776 2254 5028], Thermoelectric Station, Xiangjiang Nitrogenous  
 Fertilizer Plant (47)

Mixed Burning of Coal Mine Reject Dump to Prevent Accumulation  
 of Slag on Boiler Water Tubes.....Yu Jianwen [0151 1696 2429],  
 Baima Power Plant (47)

Replacing of Packing Sealing with Labyrinth Water Sealing in  
 48sh-22A Centrifugal Pumps.....Zhang Yuting [1728 3768 0080],  
 Xutang Power Plant (48)

Prevention of Erratic Circuits in Secondary Wirings.....  
 Zhang Zhengrong [1728 2973 1369], Sanming Power Bureau, Fujian (49)

Development of a New Impulse Relay.....Liu Hongyun [0491 4767  
 6663], Hunan Hydroelectric Power Testing and Design Institute;  
 Li Yinglin [2621 2503 7207], Xiangtan Relay Plant (51)

Hydraulic Tree Trimmers and Hydraulic Press for Conductor  
 Connections..... (54)

#### Conference Briefs

Seminar for Anti-abrasive Spare Parts of Coal Pulverizers..... (55)

Seminar for Experiences with Water Separators of Cooling Tower  
 and Conservation of Water in Power Plant..... (55)

Seminar for Experiences with Technology of Assembly of Steam  
 Turbine..... (56)

Conference on Operations Safety in Electric Power Industry..... (57)

#### Topics from Abroad

Comprehensive Utilization of Ash of Thermal Power Plant Abroad  
 .....Zhou Feng [1352 7364] (58)

New Materials--Key to Future Transmission and Distribution..... (62)

CPEM 80 Held Recently in West Germany.....Chen Shiheng [7115  
 1102 5899] (63)

9717

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AUTHOR: None

ORC: None

TITLE: "Weapons in the News"

SOURCE: Beijing HANGKONG ZHISHI (AERONAUTICAL KNOWLEDGE) in Chinese No 12, Dec 80 p 13

ABSTRACT: This article introduces the following newly developed weapons: 1) the earthquake bomb, which is primarily a fire-generating weapon used to destroy tanks and airports; 2) the "inserted cannon shell", which was developed by the U.S. Air Force Weapons Laboratory for use on airborne cannons; 3) the anti-armor distributed bombs, which upon explosion can eject pallets travelling at speeds up to 3000 m/sec; 4) the large area anti-armor special bomb, which is a bus carrying individually targeted small missiles equipped with homing devices; the missile can be either ballistic or powered by a solid rocket engine; 5) the long-range anti-armor missile, which can be launched at a large distance from the target and guided toward it under power; it explodes in mid air and releases high velocity shells.

AUTHOR: ZHAO Baoguang (6392 1405 0342)

ORC: None

TITLE: "Oxidized Film on Aluminum Alloy"

SOURCE: Beijing HANGKONG ZHISHI (AERONAUTICAL KNOWLEDGE) in Chinese No 12, Dec 80 pp 18-19

ABSTRACT: It is known that aluminum is naturally resistant to corrosion because of the formation of a layer of oxidized film on the metallic surface. However, the corrosion resistance of aluminum alloys is inferior and artificial means must be used to increase the thickness of the oxidized film. A simple way to accomplish oxidization is to submerge the alloy in boiling water or steam. Industrial aluminum alloys are oxidized by chemical or electrical methods; such treatment can increase the thickness of oxidized film by a factor of several hundred. Due to the porous structure of the oxidized film, aluminum alloys should be coated with a sealant to further enhance protection. The oxidized film also serves as an excellent undercoat for paint.



AUTHOR: GAN Chao [3927 6389]

ORG: None

TITLE: "Fault Tolerant Computers and Software Reliability"

SOURCE: Beijing HANGKONG ZHISHI (AERONAUTICAL KNOWLEDGE) in Chinese No 12, Dec 80 pp 24-25

ABSTRACT: With the rapid development of computer technology, two branches of computer science, i.e., fault tolerance techniques in computer hardware and reliability in computer software have also made significant progress in recent years. Fault tolerance techniques can be divided into the following three aspects: fault diagnostics, fault isolation, and automatic function recovery. The objectives of fault tolerance techniques are accomplished by increasing computer circuits, programming steps, information content, or operating time. To improve software reliability, many computer manufacturers and software companies have adopted the following effective measures: 1) organizing programmers into task groups; 2) developing relatively fault-free high level programming languages; and 3) establishing systematic software design procedures.

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CFO: 4009

AUTHOR: SHI Cui [097 295 2429]  
 HU Zixiang [188 120 6272]  
 CHEN Yuqin [711 017 0945]  
 et al.

ORG: All of the Institute of Electrical Engineering, Chinese Academy of Sciences

TITLE: "Chemical Composition in Equilibrium, Thermodynamic and Electrical Physical Properties of Combustion Gas Plasma Used as Working Substance for Open Cycle MHD Power Generators"

SOURCE: Beijing GONGCHENG XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 4, Nov 80 pp 329-336

TEXT OF ENGLISH ABSTRACT: The method and results of calculating chemical composition in equilibrium, thermodynamic and electrical physical properties of seeded combustion gas plasma are described. Effects of these properties on some performances of MHD power generators are treated. In this calculation 23 components and 26 thermodynamic and electrical properties are considered.

The conditions of calculation are:

fuel: Diesel oil

$O_2/N_2 = 0.21/0.79$  to  $0.21/0.79$  (air) to 1.0 (pure oxygen)

equivalence ratio:  $\phi = 0.7$  to 1.1

[Continuation of GONGCHENG XUEBAO No 4, Nov 80 pp 329-336]

plasma seed:  $Li = 0.01$  to 0.1%

concentration of  $K_2CO_3$  in aqueous solution:  $m = 0.5$  to 1.0

temperature of seed:  $T_p = 298$  K to 1000 K

temperature of the combustion product:  $T = 2000$  K to 3000 K

adiabatic exponent:  $\gamma = 1.2$  to 1.4

The data have been used for design, theoretical analysis and diagnosis of MHD power generators.

AUTHOR: ZHANG Yaokai [1728 5069 4430]  
GONG Zengjin [7895 1073 6930]  
SHEN Mengyu [3088 1322 5148]

ORG: ZHANG and GONG both of the Computing Center, Chinese Academy of Sciences;  
SHEN of Qinghua University

TITLE: "On the Solution of Transonic Flow of Plane Cascade by a Time Marching Method"

SOURCE: Beijing GONGCHENG KEWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 337-340

TEXT OF ENGLISH ABSTRACT: This paper is a supplement to our previous work. First, three points from computational experiences are stated. Then a necessary condition for stability is presented. Finally, a computational example is provided. This example shows that our numerical solution is quite accurate.

AUTHOR: ZOU Zixiang [6760 3320 4382]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Method of Calculation of the Optimum Velocity Distribution on Arbitrary Stream Surface of Revolution for the Compressible Fluid Flow in the Cascade of Turbomachinery"

SOURCE: Beijing GONGCHENG KEWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 341-347

TEXT OF ENGLISH ABSTRACT: Based on the theoretical analysis of the boundary layer and the calculation of the cascade losses by the use of the "Optimal control technique," a method of calculation of the optimum velocity distribution on the cascade surface in two-dimensional incompressible steady flow is presented. The method is then extended to the compressible flow on an arbitrary surface of revolution. It is proved that the optimum velocity distribution remains to be optimum when it is extended to a cascade on an arbitrary surface of revolution in compressible fluid flow.

AUTHOR: None

ORG: Group for Turbine Design, Designing Department, Zhuzhou Aircraft Engine Factory; Group for Turbine Test, Shenyang Aircraft Engine Institute

TITLE: "The Experimental Research on the Turbine Design of Circulation Control Method"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 4, Nov 80 pp 348-355

TEXT OF ENGLISH ABSTRACT: A single-stage turbine is designed by using a circulation control method. It has broken the conventional law of design. A model experiment was conducted in order to demonstrate the reliability of this method. A general characteristic was measured over a wide range. The efficiency distribution along blade span and the inlet and outlet velocity triangle measurement of rotor blades were made around the designing point. The main test results are given and the simple analysis is applied to it. The results indicate that the main characteristics of the circulation control design were demonstrated and the design requirement has been reached on the whole. This method is practicable.

AUTHOR: GE Manchun [5514 3341 0443]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "The Estimation of Transonic Turbine at Off-Design Conditions"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 4, Nov 80 pp 356-363

TEXT OF ENGLISH ABSTRACT: We obtain a group of simultaneous equations, including equations of  $S_2$  stream surface, simplified  $S_1$  stream surface (for use in the solution of the triangle region at tail of cascade), flow loss and deviation angle correlations, for calculation of direct problems in turbomachines. The design point as well as off-design point performances can be calculated with the solution of these equations.

The essential difference in treating sub-critical, critical and super-critical flow conditions is considered. The influence of losses is taken into account in the calculation of choking conditions. We adopt a unified approach in solving these equations. Losses, deviation angles and other flow parameters are obtained in the same iterative process so that a false choking condition will not occur and convergence will be rapid. The computer program was then completed and may be used in the calculation of the off-design performance of transonic turbines.

[Continuation of GONGCHENG RENULI XUEBAO No 4, Nov 80 pp 356-363]

In applying this program to the calculation of the performance of the existing turbine stage, we obtained satisfactory results. The reduced flow rate, efficiency and expansion ratio are fairly consistent with the experimental results. The difference between the computing results and experimental data is within 1 percent.

AUTHOR: ZHANG Baodong [1728 0202 2767]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Perturbation Equations of Blade Force Based on the Stream-Surface"

SOURCE: Beijing GONGCHENG RENULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 4, Nov 80 pp 364-370

TEXT OF ENGLISH ABSTRACT: This paper shows that the stream-surface theory does not take into account the actions of secondary flow induced by the disturbance blade force. Based on the stream-surface, the generalized equation of such a secondary flow in an axial-turbomachine is deduced. Compressibility of flow is corrected with the local Much number of the primary flow to avoid the errors which are brought out by using only the Much number upstream or a given average Much number in the traditional linearized theory. The existence of the primary flow vorticity is reflected in a so-called stream-sheet thickness  $b$  of the  $S_2$  stream surface of the primary flow. The  $b = 1$  represents an irrotational primary flow or the case in which the primary flow vortex is negligibly small. The  $b = 0$  is a limiting case which represents the vorticity of the primary flow becoming infinite. Then an attempt to approach the secondary flow problem of large shear and large disturbance flow is tested.

This paper also shows the equations deduced from the generalized equation under the conditions of the compressible axi-symmetric axial-inlet flow and the

[Continuation of GONGCHENG REWULI XUEBAO No 4, Nov 80 pp 364-370]

incompressible 2-D plane cascade flow. Then it shows that the generalized equation is appropriate for correcting the effects of the secondary flow on the stream surface flow after comparing it with the equations in the references [Okurounmu; Falcao; Hawthorne] when the assumptions of lifting line theory are adopted.

AUTHOR: LIU Dengyun [0491 4098 8661]  
GE Shaoyan [5514 4801 1484]  
YANG Yaxian [2799 7161 6343]  
LI Jing [2621 7234]

ORG: All of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Experimental Investigations on the Coefficients of Heat Transfer of Film Cooling"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 4, Nov 80 pp 371-377

TEXT OF ENGLISH ABSTRACT: Critical reviews have been made on the correlations of coefficient of heat transfer by film cooling. The theoretical results of Xie Xiangchun and Spallling have been compared with the experimental results of the present authors. Experimental work has been carried out on an electrically heated flat plate. A set of correlation equations on the coefficients of heat transfer of film cooling have been proposed.



AUTHOR: MA Chongfang [7456 6850 5364]  
QI Zongmin [7871 1350 2404]

ORG: Both of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Analysis and Computer Simulation of Heat Transfer Process in the Rotary Combustion Engine"

SOURCE: Beijing GONGCHENG RENWU XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 378-383

TEXT OF ENGLISH ABSTRACT: A heat transfer model of the R-C engine is presented which performs a leakage mass balance and accounts for sweep flow, boiling on water side and other ignition and combustion characteristics. The simulation of heat transfer based on this model is implemented on a digital computer. Model predictions of wall temperature, heat flux and global heat transfer are in good agreement with measurements.

AUTHOR: XU Xuchang [1776 2485 1603]  
LIN Ruiyong [2651 3843 6978]

ORG: Both of Qinghua University

TITLE: "The Experimental Research Method under Production Conditions for Heat Exchangers"

SOURCE: Beijing GONGCHENG RENWU XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 384-392

TEXT OF ENGLISH ABSTRACT: For the development of heat exchangers, experimental research on industrial equipment under production conditions is as important as experimental research in laboratories under idealized conditions. In this article, the method for experimental research on industrial equipment under production conditions and the processing of the obtained data are discussed. A general formula for the calculation of industrial heat exchangers is proposed. The author takes the basic heat transfer coefficient  $K_0$ , the derived coefficient of fouling  $\epsilon$  and the heat transfer modifier  $\Omega$  as the three main factors. Regressive analysis is used to process the data obtained from the steam superheaters of a utility boiler. The influence of these factors has been found clearly by this analysis.

AUTHOR: LIU Qingguo [0491 1987 0948]  
CHENG Bingtai [2052 4426 3141]

ORG: Both of the Institute of Shenyang Aeroengine Company

TITLE: "Some Problems on the Method of Measurement and Calculation in the Combustion Efficiency Test of Gas Turbine Combustion Chamber"

SOURCE: Beijing GONGCHENG KEWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 393-400

TEXT OF ENGLISH ABSTRACT: This paper presents some improvements in the method of measurement and calculation in the combustion efficiency test on the basis of systematic analysis and test investigation. It will be possible to apply them to future tests.

AUTHOR: CHEN Danzhi [7115 0030 0037]

ORG: Xi'an Jiaotong University

TITLE: "The Modeling Rules of Steady Performances of Combustion Systems at Low Flow Mach Number"

SOURCE: Beijing GONGCHENG KEWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 401-407

TEXT OF ENGLISH ABSTRACT: Based on similarity principles and some typical operating mechanisms of combustion engines, the present paper suggests the modeling rules of steady performances of combustors at low flow mach numbers. The similarity and modeling rule of a combustor depends not only on the geometrical factors of the combustor and the properties of the fuels used, but also depends on the factors of the combustion process and the performances of the combustion engine.

In this paper, the author puts the emphasis on the scaling of the spray combustion systems. After suggesting the chief modeling criterion of the blow off limit, an expression relating to the performance parameters at these conditions is derived.

AUTHOR: LIN Fulai [2651 4395 0171]

ORG: Institute of Electrical Engineering, Chinese Academy of Sciences

TITLE: "Measurement of the Flame Temperature in MHD-Generator"

SOURCE: Beijing GONGCHENG RENULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]  
in Chinese No 4, Nov 80 pp 408-412

TEXT OF ENGLISH ABSTRACT: The flame temperature is measured under MHD-generation conditions. The formula for probable error in temperature measurement is given. It is used to calculate the probable error under the condition that the fractional errors in each radiative intensity measurement may be arbitrary. The relation between the slit width and error is discussed. It shows that under the conditions that the fractional errors keep constant and the ratio of the slit width  $\Delta\lambda$  to the spectral line width  $\delta\lambda$  is greater than 1, the larger the ratio  $\Delta\lambda/\delta\lambda$  the greater the probable error.

9717

CSO: 4009

AUTHOR: LIU Youchun [2692 0642 2504]

ORG: None

TITLE: "Several Climatic Characteristics of Sichuan Basin"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 80 pp 4-5

ABSTRACT: This paper describes 6 climatic characteristics of the Sichuan Basin. (1) Warm winters: Compared with the middle and lower reaches of the Yangtze, the winter temperature of areas of Sichuan Basin of the same geographical latitude is generally 2-4°C higher. (2) Early springs: Spring comes about a month earlier to the basin compared to regions of Shanghai and Nanjing. (3) Hot summers: The mean temperature of July is generally 26-29°C and may reach 33.5°C in some areas of the basin. (4) Autumn rains: On the average 1.5 to 2 days in 3 are rainy days yet the total precipitation is the lowest in autumn. (5) Lots of clouds and very little sunlight: The number of overcast days in the basin averages more than 200 in a year. (6) Night rains: With so many clouds the air is moist. At night, condensation causes rain. In Sichuan Basin and the region of Dabashan, about 65 percent of the total rainfall comes during the period after 8 p.m. and before 8 a.m.

AUTHOR: WANG Tinghui [3769 1656 2849]  
ZHANG Chuansao [1728 0878 5679]

ORG: None

TITLE: "Saltworks of Huaihai"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 80 pp 6-7

ABSTRACT: Huainan and Huabei [South and North Banks of the Huaihe] were among the most famous salt-producing regions of China, historically. In 1194, Huanghe moved southward and took over Huaihe. Its large quantity of silt forced the coastline to extend eastward and caused the saltworks of Huainan to be farther and farther from the sea. As the salt industry declined in Huainan, that of Huabei prospered. Aside from northern Jiangsu and southern Shandong, its salt found market in Hunan, Hubei, Jiangxi, and Henan as well. During the first half of the 20th Century, storms washed out the saltworks and salt production was reduced to a mere 300,000 tons. After the liberation, the state invested 5 million yuan to build a dike more than 200 km in length to protect the saltworks from the sea. Since 1958, 6 chemical plants have been established to utilize the waste brine of the salt-producing process to manufacture potassium chloride, magnesium chloride, bromine, anhydrous mirabilite, metallic magnesium, etc. The saltworks also produce such chemical fertilizers as potassium magnesium, sodium magnesium, magnesium hydroxide, etc. to sell in many parts of the country. The paper includes a map depicting the current distribution of saltworks along the coast of the Yellow Sea to the north of Huaihe.

AUTHOR: LU Yanjie [6484 1693 2212]

ORG: None

TITLE: "Changes of Daminghu"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 80 p 12

ABSTRACT: Daminghu is the famous lake of Jinan City. Although, to the east and the west, the springs are now no longer connected with Daminghu, it is still fed regularly by the various springs to the south. Toward the end of Jin Dynasty [about 1279 A.D.] the lake was known to occupy a third of the city. A recent survey by the city's department of construction reports the area of the lake to be 705 mu. It is believed to be several tens of times larger in ancient times. This paper traces briefly the historical records of the lake and its various buildings, bridges, and dikes. For example, when the wall of the city was constructed, the part of the lake, known as Beiyuan today, was separated from Daminghu. Whenever flood water swells Beiyuan, which is outside of the city, the surplus water still drains into Daminghu, however.

AUTHOR: ZHANG Mingfa [1728 2494 4099]

ORG: None

TITLE: "The Longest Highway Bridge of Hanjiang is Completed and Open for Traffic"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 80 p 14

ABSTRACT: Laohekou City is located on the eastern shore of Hanshui [the River Han, same as Hanjiang] in the northwestern part of Hubei Province. It is an important junction of the 4 provinces of Hubei, Henan, Sichuan, and Shaanxi and is a pathway connecting the plain of Hanjiang and Yangzi with the mountainous region of the north. Near the city, the river is wide and the flow is swift to create difficulty for the ferry. Most recently, the highway bridge has been officially open to traffic. The bridge measures 2,000 m. It is the second longest highway bridge in China, having 58 spans and 59 supports. On both sides of the bridge, there is a pedestrian walkway, 1.5 m in width. The center roadway is 9 m in width. Under the bridge, the clearance for boats is 8 m in height.

AUTHOR: LIU Yintan [0491 5255 3155]

ORG: None

TITLE: "A Climatic Demarcation Line"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 11, 80 pp 4-5,3

ABSTRACT: Qinling is the mountain range in Shaanxi, about 400-500 km from the east to the west and about 100-150 km from the south to the north. The name Qinling was originally given by foreign scholars just as Changjiang was named the Yangzi by foreigners. In Chinese ancient classics different sections of the mountain range are referred to by different names. In China, the low layer atmospheric currents are mostly in the south-north direction, and being an east-west mountain range, Qinling is an obvious barrier, especially in the winter. As the cold air is blocked by the tall and large mountains, the temperature of areas south and north of the mountain range is very different, reaching 6-7°C. This difference also causes a difference in vegetative and animal systems. This paper describes Qinling as a major factor for the difference in climate and landscape of the 2 regions.

AUTHOR: WU Dengshan [4717 4098 1472]  
HUANG Yiduan [7806 0034 4551]  
TIAN Jiying [3944 4480 3853]

ORG: None

TITLE: "Bitter Water of the Loessial Plateau"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 11, 80 p 31

ABSTRACT: The loessial plateau is in the region of 34-41° N. Lat. and 101-114° E. long. totalling 580,000 km<sup>2</sup> and having a population of 60 million. This is the region of the thickest loessial deposit in the world. It has a continental climate and is a dry area, with very little rain and a great deal of wind and sand. When the atmospheric precipitation seeps through the loessial strata, the soluble salts, such as gypsum, mirabilite, rock salt, magnesite, etc. are leached and dissolved and brought to the aquifer to form the bitter water. The degree of mineralization of the bitter water varies a great deal from area to area in the loessial plateau. In some areas, it is still suitable for irrigation, in others not. The formation of bitter, its chemical composition, and its possible utilization are discussed.



AUTHOR: CHEN Shanghui [7115 0006 1145]

ORG: None

TITLE: "All Out Effort to Develop Power Stations in Mining Regions"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 17, 80 pp 1-2

ABSTRACT: China is rich in coal and hydraulic resources. The known coal reserve is 400 billion tons and the hydraulic resources capable of being developed and utilized are estimated to be the first in the world. Aside from urgently constructing hydroelectrical power stations, thermal power plants should also be built in large numbers to utilize the coal. Based upon the reality of insufficient railway facility, the author proposes the construction of power stations in the coal mining regions to save transportation, while high voltage power transmission line may be economically and reasonably built to deliver the power where it is needed. At present more than 10 power stations are being constructed in coal mining regions. Advantages of building thermal power stations in coal mining regions are explained.

AUTHOR: WANG Menglin [3769 1125 2651]  
CHEN Dexin [7115 1795 3046]

ORG: None

TITLE: "The Panjiakou Reservoir in the Process of Construction"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 17, 80 p 13-

ABSTRACT: Panjiakou Reservoir is located at the foot of the Great wall between Tangshan and Chengde in Hebei Province. From Beijing, the construction site is 190 km to the east. The reservoir is designed to develop the water resources of Luanhe to supply water to the cities and, at the same time, to generate electricity, to prevent flood, and to raise fish. The reservoir was to be filled in December of last year. When the water reaches the design level in March this year, the dam will be opened to nurture the water resources in the lower reaches, and to help raise the ground water table. The geographical environment of the reservoir is described. A map of the region is included.

CSO: 4009

AUTHOR: QIAN Weizhang [6929 6251 7622]  
XIE Zhicheng [6206 1897 6136]  
QIEN, Shihang [6774 1835 2856]  
WANG Ruimin [3769 1861 0061]

ORG: All of Qinghua University

TITLE: "Shape Functions of a Compatible Bending Triangular Finite Element and Their Related Stiffness Matrix"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] In Chinese No. 4, 11 Dec 80 pp 1-11

TEXT OF ENGLISH ABSTRACT: In this paper, the explicit expressions for the shape functions of a compatible bending triangular finite element with 21 degrees of freedom are obtained with the help of the areal coordinates. The related stiffness matrix is also tabulated.

AUTHOR: MA Jingzhi [1536 9136 1987]

ORG: Shanghai Ocean Machine Plant

TITLE: "Finite Element Method in the Solution of Two-Dimensional Transient Temperature Field Problems"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] In Chinese No. 4, 11 Dec 80 pp 12-25

TEXT OF ENGLISH ABSTRACT: As is well known, in the solution of transient temperature field problems a finite element discretization in the space dimension will be used. However, in the time dimension we usually use the finite difference discretization. This paper is concerned with the analysis and comparison of two different calculating schemes, the Crank-Nicholson formulation and the Galerkin process, in the time dimension. Special emphasis is given to the application condition of these two schemes with regard to the short-time accuracy. Some examples are given, and it will be seen that quite good agreement was obtained between the error analysis and the numerical results. In the solution of transient temperature field problems with nonlinear boundary conditions, a satisfactory accurate "tangent" iterative method, which converges faster after only a few steps, is suggested. Finally, also discussed is the selection of mesh and time step, and how to obtain a more accurate numerical solution with the least machine time.

AUTHORS: CHEN Renxi [7119 OURR 1889]  
LIN Xiangzhi [2651 7449 8560]  
WANG Shaoyao [1769 4801 0146]  
PAN Wofu [1382 4850 1381]

UNITS: CHEN and LIN both of Shaanxi College of Mechanics; WANG of Xi'an High Voltage Electrical Ceramics Plant; PAN of Xi'an Electric Furnace Institute

TITLE: "The Chemical Vapor Deposition (CVD) of Titanium Carbide on Steel Substrate"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 4, 15 Dec 80 pp 26-32

KEY OF ENGLISH ABSTRACT: Titanium carbide coating with appropriate thickness ( $0.1\sim 1.5\mu$ ) possesses some excellent properties, such as high melting point, high hardness, low coefficient of sliding friction and appropriate anticorrosive properties. Therefore it may be used for special purposes. However, the CVD of TiC still encounters the following problems which limit the field of its application. 1. The temperature of the CVD process is too high, being even higher than  $1100^{\circ}\text{C}$ . At this temperature the grains of steel will be coarsened and hence the properties will deteriorate. 2. Since the difference of the coefficient of thermoexpansion between the TiC coating and steel is so great, the cohesion between the coating and the substrate is not quite strong.

[Continuation of JIXIE GONGCHENG XUEBAO No 4, 15 Dec 80 pp 26-32]

1. In order to increase the loading ability of the work pieces, we must find a method to improve the strength of the substrate below the CVD coating.

A thermodynamic analysis of some chemical reactions of the CVD process is demonstrated in this paper. Based on this analysis, the authors suggest using some titanium sponge in the reaction chamber and also using carbon tetrachloride instead of trichlorobenzene as the carbon supplier of the CVD process of TiC. When using this suggestion, the temperature of the CVD of TiC on steel may be lowered to  $900^{\circ}\text{C}$  or even lower.

If work pieces undergo a suitable chemical heat treatment first, a transition layer may be formed between the TiC coating and the substrate following the CVD process. The existence of the transition layer may lessen the difference of the coefficient of thermoexpansion between the TiC coating and the substrate so that the cohesive strength between them will increase by 30 percent.

The authors have successfully increased the strength of the substrate of the work pieces by reheating them in a fully deoxidized salt bath and quenching them in an alkaline bath.

This technique has been used in the production of a number of tools and machine parts, the working life of which has been proved to be greatly prolonged.

AUTHOR: CHEN Zhixin [7115 1807 2450]

ORG: Shanghai Industrial University

TITLE: "Tooth Form of P K Conjugation"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING]  
in Chinese No 4, 15 Dec 80 pp 43-46

TEXT OF ENGLISH ABSTRACT: In this paper, a brief introduction to tooth form of P K conjugation is presented. Essential points for designing the basic tooth surface of the tooth form of P K conjugation and the principles for determining curvature modifications for the replasing surface are narrated. Various methods for manufacturing this tooth form, and the constituents of the calculating program for this tooth form are enumerated. The codes for the standard procedures used in the source programs for tooth form of P K conjugation are explained. Tables manifesting the constituents of the calculating programs for various types of tooth form of P K conjugation and two illustrative examples for composing the source programs are set forth in this paper.

AUTHOR: CHEN Xichen [7115 3556 1819]  
Yi Sunsheng [2496 1127 5110]  
WANG Zulun [3769 4371 0178]  
et al.

ORG: All of the Institute of Physics, Chinese Academy of Sciences

TITLE: "Graphite Growth in Iron-Carbon Melt"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING]  
in Chinese No 4, 15 Dec 80 pp 47-56

TEXT OF ENGLISH ABSTRACT: Graphite crystals were grown in the melts of Fe-C, Fe-C-S and Fe-C-S-Ce alloys, with pyrolytic graphite as the seed. The microstructure of the layers between the epitaxially grown plane and the (0001) and (10 $\bar{1}0$ ) crystal planes was studied. The orientation of the (0001) crystal plane was determined by means of ion etching techniques and the surface of the epitaxial layer was investigated by topography and X-ray diffraction analysis. A new result regarding the growth mechanism of graphite in Fe-C alloy has been obtained which supports the model proposed earlier by the authors.

In this paper it is noted that the rate of growth for both (0001) and (10 $\bar{1}0$ ) graphite crystals is nearly the same when there is no interference from activated elements such as S, V, etc. However, the forms of their growth are different. Growth in the

[Continuation of XIKE GONGCHENG XUEBAO No 4, 15 Dec 80 pp 47-48]

growth direction is spiral; whereas growth in the  $(10\bar{1}0)$  direction is in the form of flat, hexagonal crystals, and some crystals even change their growth into the  $(10\bar{1}0)$  direction. Interference from S displaced some of the  $(0001)$  plane spiral crystals and other spiral crystals grew tilted and staggered. Growth based on the  $(10\bar{1}0)$  plane is unstable because of blocking action from S, and most of them change their growth direction to that of the twin crystal plane. The spheroidization effect of Ce is to combine with S and O as a consequence restraining them both.

It has also been found that after adding rapid splitting and spiral growth of crystals based on the  $(0001)$  plane, there occurs a bunch of crystals tilted at a small angle with one another. In the course of growth these crystals progressively change their orientation, thus becoming spherical. The crystal plane  $(10\bar{1}0)$  is restrained on addition of Ce and changes its orientation immediately. This also leads to spherical growth.

AUTHOR: LI Changbiao [049] 7022 [428]

UNIT: Beijing Aeronautics Institute

TITLE: "The Optimized Design Theory for Three Types of Electro-hydraulic Force-Appling System"

SOURCE: Beijing XIKE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] Vol 15, No 4, 15 Dec 80 pp 47-48

KEY OR ENGLISH ABSTRACT: An optimized design theory of electro-hydraulic force-applying system is presented in this paper. Included are: 1) System optimization: Electro-hydraulic force-applying systems are divided into three types--follow type, combination type and differential type, and the optimized design methods are given for each type; 2) Element optimization: Here a P-Q calculating chart is introduced which can be used for selecting the optimum values of the load-free flow of the servo valve and effective cross-sectional area of oil-cylinder; 3) The principle of structure invariability is given, which can be applied to eliminate the internal disturbance, load effect and the cross linking effect; 4) Two kinds of operation conditions and several installation methods of servo valve are introduced in the paper in order to reduce the problems of disturbance of the disturbing forces and the relationship between the target and the open center of the servo valve.

AUTHOR: YANG Donghua [2799 2639 5478]

ORG: Zhengzhou Institute of Technology

TITLE: "The Calculation and Analysis of Thermodynamic Properties of Combustion Gases"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 4, 15 Dec 80 pp 89-100

TEXT OF ENGLISH ABSTRACT: This paper discusses thermodynamic properties of combustion gases of fuels in C-H-O-N's; four immediate calculation methods with various accuracy are suggested; analyses of accuracies of various approximate calculation methods suggested up to this moment (including that suggested by this paper) are presented; the law computing thermodynamic properties of combustion gases is summed up.

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CSO: 4009



Seismology

AUTHOR: CHEN Jiachao [7115 1367 6389]

ORG: None

TITLE: "Subsidence and Earthquake"

SOURCE: Beijing DIZHEN ZHANXIAN [SEISMOLOGY FRONT] in Chinese No 6, 26 Dec 80  
pp 9-11

ABSTRACT: Subsidence is a natural phenomenon of the earth's crust. Based upon the causes, it is commonly divided into karst subsidence, ground water subsidence, man-made subsidence, tectonic subsidence, liquefaction subsidence, etc. This classification is suitable for geology, but not for seismology. With respect to seismology, it may be divided into the seismo-genetic and the non-seismo-genetic. The necessary condition for the former is the preexistence of a free space under the ground surface. All the aforementioned subsidence belong to this type except for tectonic and liquefaction subsidence, in which case a cavern does not exist before the occurrence of subsidence. In case of all the other forms of subsidence, the side walls or the top may subside under the influence of gravity and an earthquake may also be formed. The genesis and process of this type of subsidence and the possible concurrent earthquake are explained with several examples. The difference between subsidence earthquake and tectonic earthquake is also discussed.

AUTHOR: LI Fangquan [2621 2455 0356]

ORG: None

TITLE: "On the Method of Producing Cracks With Water Pressure"

SOURCE: Beijing DIZHEN ZHANXIAN [SEISMOLOGY FRONT] in Chinese No 6, 26 Dec 80  
pp 14-16, 21

ABSTRACT: Studies on earthquake forecasting and control, safety design of underground and surface construction, the development of oil and gas wells as well as geothermal energy, the interpretation of various geological phenomena, etc. necessitate a thorough understanding of the stress condition in the earth's crust. The determination and study of the stress condition in the deep portion of the earth's crust are, therefore, a very important matter and the method of producing cracks with water pressure is one of the techniques of determining the stress in the deep part of the crust. This paper explains in detail the theory and the procedure of determining geo-stress with the water pressure crack producing method.

AUTHOR: LI Xuanhu [2621 1357 3840]

ORG: None

TITLE: "Characteristics of Geochemical Anomalies in Beijing Region Before the Tangshan Earthquake"

SOURCE: Beijing DIZHEN ZHANXIAN [SEISMOLOGY FRONT] in Chinese No 6, 26 Dec 80 pp 17-19

ABSTRACT: Before the 7.8 earthquake occurred in Tangshan, a number of geochemical anomalies were recorded in the region of Beijing. Some of these had led to premonitions of earthquake as well. In the 4 years since the Tangshan earthquake, hindsight also has proved the reliability of the observed anomalies. The observed geochemical anomalies discussed in the paper include: (1) Radon density of ground water; (2) Total contents of dissolved gases in the ground water; (3) Content of dissolved carbon dioxide in the ground water; (4) Electrical conductivity of water. Characteristics of these geochemical anomalies are analyzed.

AUTHOR: ZHAN Shigao [6124 1102 7559]  
WANG Yuzhen [3769 3768 3791]

ORG: None

TITLE: "Preearthquake Movements Before the Kuche Earthquake of Magnitude 6 on the Richter Scale"

SOURCE: Beijing DIZHEN ZHANXIAN [SEISMOLOGY FRONT] in Chinese No 6, 26 Dec 80 pp 20-21

ABSTRACT: Since 1972, 4 medium intensity earthquakes have occurred in the Kuche region of Xinjiang, on 9 Apr 72, 10 Jan 76, 23 Jul 77, and 29 Mar 79 in magnitudes of 5.6, 5.6, 5.5, and 6.0 on the Richter Scale respectively. About 5 months after the aftershocks of the 3rd had diminished and concluded, new movements began in Jun 78. According to statistical records, from Jun 78 to 29 Mar 79, there were more than 100 preearthquake movements, and 3 of these were in fact earthquakes of above 3 magnitude. Tables are given to analyze the intensity of these movements and there is also a map to depict the horizontal distribution of these preearthquake movements. The authors conclude that these preearthquake movement data clearly indicate that the current displacement in the region is a rift of the northeastern direction under the action of the regional major pressure stress of the south-north direction. The latitudinal pressure structure is only adding to the complexity of the region.

AUTHOR: LU Zhenye [4151 2182 2814]  
SUN Ruomei [1327 5387 2505]

ORG: None

TITLE: "Turning Point of the Time Sequence Curve of Elements of Geomagnetic Field"

SOURCE: Beijing DIZHEN ZHANXIAN [SEISMOLOGY FRONT] in Chinese No 6, 26 Dec 80  
pp 31-33, 44

ABSTRACT: The long term variation of the geomagnetic field is a change of a not very obvious cyclic characteristic. It often appears to be increasing in a relatively long period of ten or several tens of years before it turns around to begin a period of decline. The amplitude and speed of change of the elements of long term variation vary with the geographical location, however. The common method of taking geomagnetic data of 2 stations for physical and mathematical analysis to produce earthquake magnetism information is, therefore, less than valid, in the opinion of the authors. The factors contributing to the long term variation of geomagnetic field remain an important and unresolved subject. Measurements of Chinese and Japanese geomagnetic stations are used to support the discussion.

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